Operator's Guide

Model "D"

Leading Edge Hardware Products, Inc.

Operator's Guide

for the
Model " D "

Fifteen-Month Limited Warranty

Leading Edge Hardware Products, Inc. warrants to the initial purchaser of the product that it will be free of manufacturing defects for a period of fifteen months following the date of purchase. This warranty does not include damage to the product resulting from accident or misuse.

This warranty will be effective only if the purchaser completes the warranty registration card and returns it, within 30 days of purchase, to: Customer Service, Leading Edge Hardware Products, Inc., 225 Turnpike Street, Canton MA 02021-2391.

If the warranty registration card is not returned, the limitation of liability and disclaimer of any implied warranties by Leading Edge Hardware Products, Inc. are still in effect.

If the product should become defective within the warranty period, we will elect to repair or replace it, provided it is delivered at the customer's expense to a Leading Edge authorized service facility. Please call our toll-free number (800) 343-6857 for the facility nearest you.

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FCC Radio Frequency Interference Statement

WARNING: THIS EQUIPMENT HAS BEEN CERTIFIED TO COMPLY WITH THE LIMITS FOR A CLASS B COMPUTING DEVICE, PURSUANT TO SUBPART J OF PART 15 OF FCC RULES. ONLY PERIPHERALS (COMPUTER INPUT/OUTPUT DEVICES, TERMINALS, PRINTERS, PLOTTERS, ETC.) THAT ARE CERTIFIED TO COMPLY WITH THE CLASS B LIMITS MAY BE ATTACHED TO THIS EQUIPMENT. OPERATION WITH NONCERTIFIED PERIPHERALS IS LIKELY TO RESULT IN INTERFERENCE TO RADIO AND TV RECEPTION.

This equipment generates and uses radio frequency energy. If not installed and used according to the operating instructions and all related manuals, it may cause interference to radio or television reception. This equipment has been tested and found to operat within the limits set forth for a Class B computing device under Subpart J of Part 15 of the FCC rules. These rules are intended to provide reasonable protection against such interference in a residential environment.

If this equipment does cause interference to radio or television reception (check by turning the equipment off and on), try to correct the interference by some of the following measures:

o   Reorienting the receiving antenna.

o   Relocating the equipment away from the receiver.

o   Plugging the equipment into a different outlet, so that equipment and receiver are on different branch circuits.

o   Checking that all mounting screws, attachment connector screws, and ground wires are properly secured.

o   Checking that card slot covers are in place if no card is mounted.

If necessary, refer problems to the dealer from whom you purchased your equipment.

MODEL D MANUALS: WHERE TO TURN FIRST

OPERATOR'S GUIDE

Read this guide first, as it serves as an introduction to the Model D. It explains how to set up and use the computer, and how to solve any problems you may encounter. Turn next to the *MS-DOS User's Guide*.

MS-DOS USER'S GUIDE

You need an operating system to run the Model D. This guide contains the basics that you need to know to run the Model D with the MS-DOS operating system. Procedures are presented in an easy-to-follow, step-by-step format. Read through the entire guide (it's short) before you begin to use MS-DOS.

MS-DOS REFERENCE MANUAL

This manual describes the features of the MS-DOS operating system in a more technical format. You'll discover more powerful ways to use MS-DOS. Read the *Reference Manual* after you're comfortable using MS-DOS and are familiar with the basic commands outlined in the *MS-DOS User's Guide*.

GUIDE TO BASIC

Before you can write BASIC programs on the Model D, you'll need to learn about GWBASIC. This book explains GWBASIC commands, statements, functions, and variables and the correct syntax for each. **It does not teach you how to program in GWBASIC.**

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Chapter 3: Troubleshooting Guide

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Appendix: Switch Settings

Glossary

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PREFACE

This manual is an introduction to the Leading Edge Model D. It explains how to set up and use the computer and how to solve any problems you may encounter.

If you are an experienced computer user, you should review the material in Chapters 1 and 2. Novices should carefully read each chapter of this guide before setting up and using the Leading Edge Model D.

This guidebook has four chapters and an appendix:

Chapter 1   **The Model D: Components and Setup**
Describes the components of the Model D and explains how to connect them. Refer to this chapter when you first set up the system and whenever you want to expand or change your setup.

Chapter 2   **Getting Started with MS-DOS**
Explains how to load MS-DOS into both the floppy- and fixed-disk systems.

Chapter 3   **Troubleshooting Guide**
Outlines the steps you must take to correct problems that may arise during setup or normal use of the computer. Contains step-by-step procedures for identifying the nature of a problem and the part of the system that is most likely at fault.

Chapter 4   **Moving the Model D**
Recommends methods for repacking and relocating the Model D. Review this chapter whenever you intend to move your computer.

Appendix   **Switch Settings and Memory Upgrade**
Describes how to set the switches on the computer's main processor board to allow for new options and how to add memory to the Model D.

CHAPTER 1
THE MODEL D: COMPONENTS AND SETUP

SYSTEM FEATURES

The Leading Edge Model D is equipped with everything you need to set it up and start it running as soon as you unpack it. It consists of a system unit, a detachable 83-key keyboard, and a 12-inch monochrome or 14-inch color monitor.

The system unit is the heart of the computer. Its standard equipment includes:

o Floppy-Disk Model: Two built-in, 5-1/4-inch, double-density, double-sided floppy-disk drives

   or

   Fixed-Disk Model: One built-in, 5-1/4-inch, double-density, double-sided floppy-disk drive and a fixed-disk drive of either 10 or 20 megabytes.

o 256 kilobytes (K) of random access memory (RAM) for program and work storage.

o A parallel input/output (I/O) port for your choice of printer.

o A serial I/O port for either a printer or a communications device.

o Built-in date and time-of-day circuit with 30-day battery backup.

o Four expansion slots. (In a fixed-disk system, one of these slots is reserved for the controller board's use; you can use the others for any combination of accessories you need.)

Since the Model D works with a wide range of IBM® and IBM-compatible hardware and software, you have many options from which to choose when expanding your system.

Figure 1-1 shows the basic setup of the Model D. Figures 1-2 and 1-3 show the dual-floppy-disk and fixed-disk systems. A fixed disk stores about 30 times more information than a floppy disk, and a fixed-disk drive retrieves data much more quickly than a floppy-disk drive.
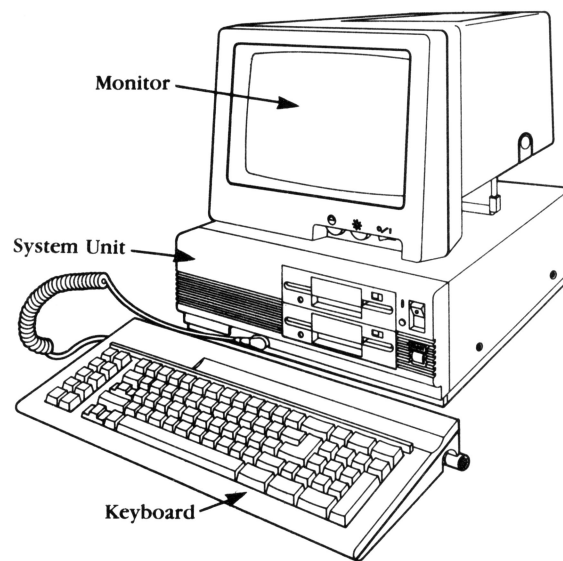
Figure 1-1 Standard Leading Edge Model D
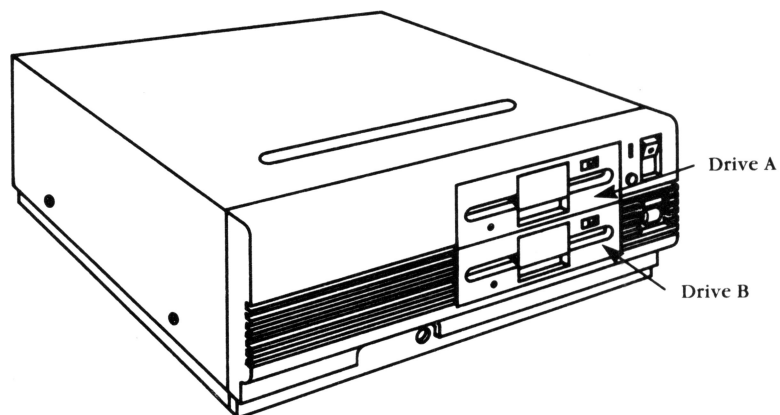
Figure 1-2 Floppy-Disk System

Floppy-Disk Drive
(Drive A)

Fixed-Disk Drive
(Drive C)
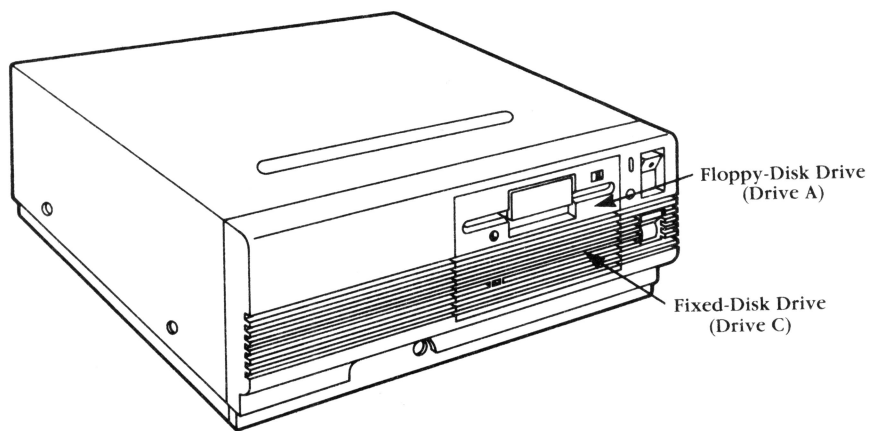
Figure 1-3 Fixed-Disk System

SETTING UP THE SYSTEM

When unpacking the Model D, start with the boxes on the floor. As you unpack
each item, move it to a tabletop or piece of furniture designed to hold a small
computer.

Start the assembly process with the system unit, as it serves as a base for the
display monitor.

Note: Keep all boxes and packing material in case you ever need to transport
your system.

THE SYSTEM UNIT

The Front Panel

The floppy-disk system includes two floppy-disk drives (Drive A and Drive
B) while the fixed-disk system has one floppy- and one fixed-disk drive
(Drive A and Drive C). Both systems have a power switch, a reset button, a
drive-door lock, a keyboard connector port, and several indicator lights.

Drive-Door Lock

Power Indicator

Power Switch

Reset Button

Disk-Drive Indicators

Keyboard Connector
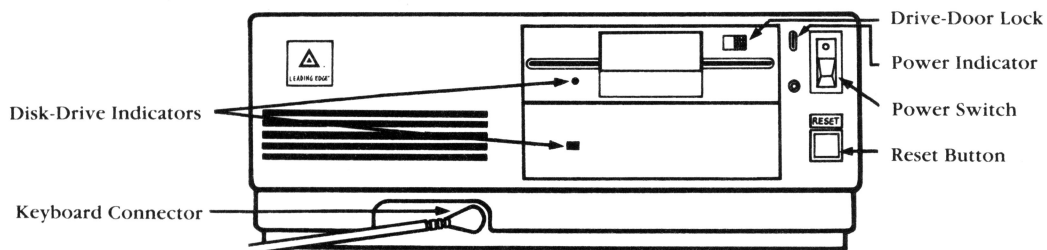
Figure 1-4 The Front Panel of the System Unit (Fixed-Disk System)

The power indicator lights up when you turn ON the system unit. Each drive indicator lights up only when the system is attempting to read a disk inside that drive.

Use the drive-door lock to lock the drive door so you don't accidentally remove a disk while running a program. This could damage the file you're working with.

The reset button lets you restart the system without having to turn the power OFF and then ON. This feature is explained further in Chapter 2, Resetting Your Model D.

The Rear Panel

The Model D's rear panel contains the power receptacles and accessory connectors you'll need to connect the system with the monitor, printer, and any other accessories you decide to use.
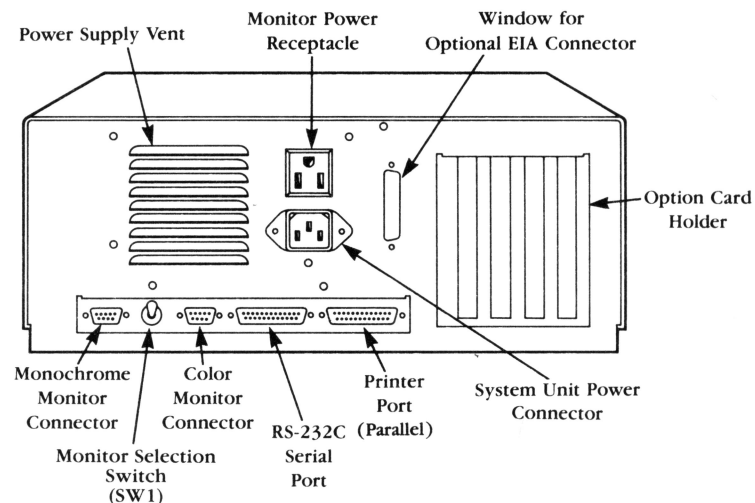
Figure 1-5 The Rear Panel of the Model D

Setting Up the System Unit

Caution

Be sure to set up the Model D in the order outlined here.

---

1. Remove the tape from the doors of the disk drives.

2. Remove the disk-shaped cardboard from the floppy-disk drive(s), and keep it in case you ever need to transport the system.
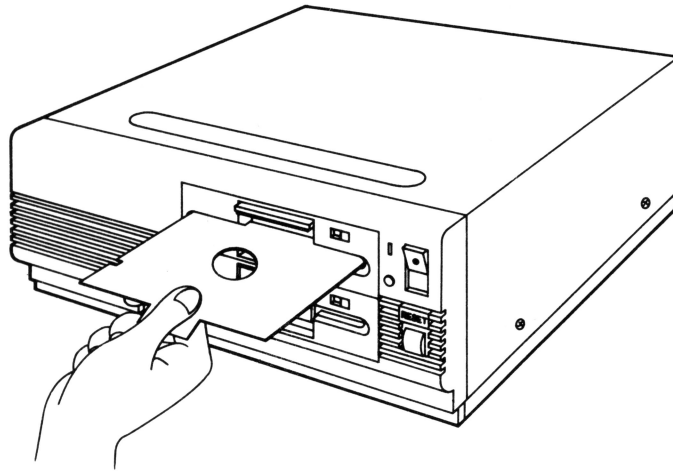
Figure 1-6 Removing Cardboard

3. Make sure the power switch is OFF.
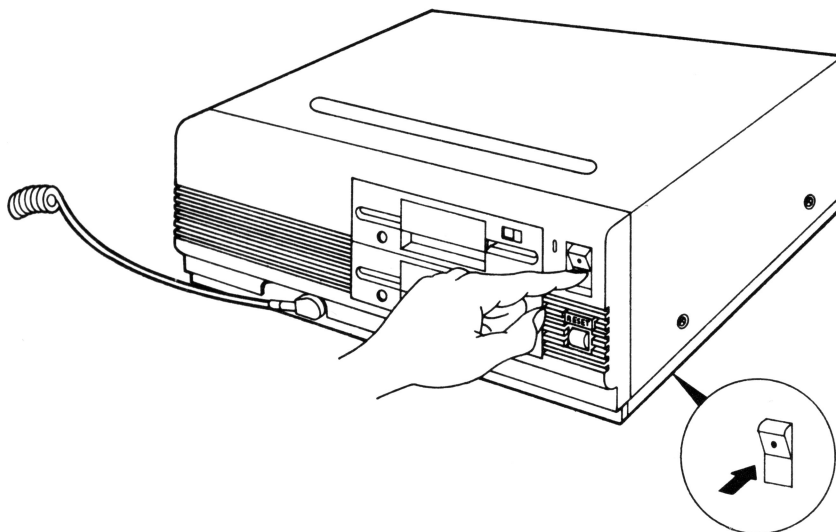
Figure 1-7 Power Switch Is OFF

4. Connect the power cable to the rear panel of the system unit and a wall outlet.
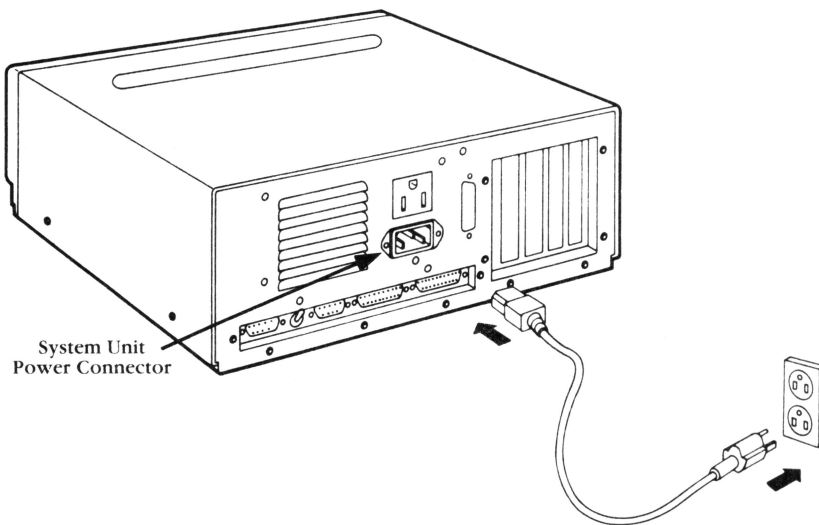
Figure 1-8 Connecting the Power Cable

5. Press the power switch to the ON position.
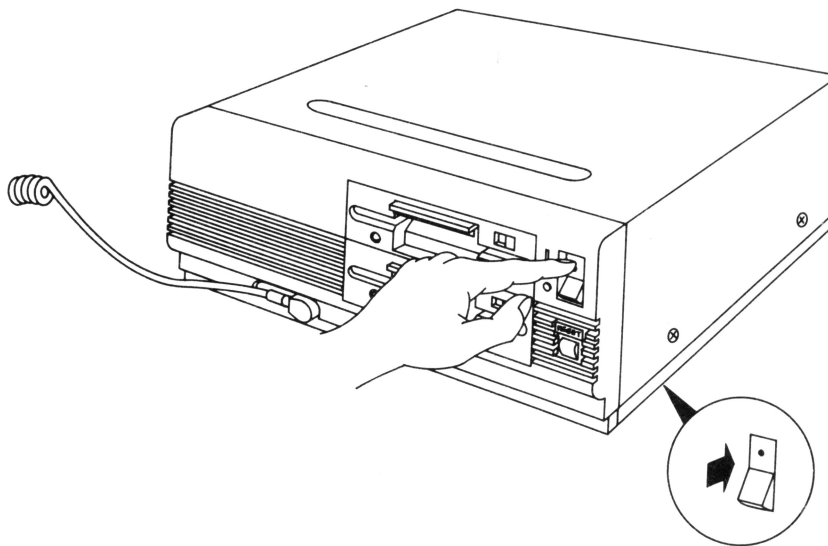
Figure 1-9 Turning the Power ON

After about 20 seconds you should hear a single beep. This indicates the system has completed a self-test of its fundamental operations and that it is functioning properly.

If you don't hear a beep, repeat steps 3, 4, and 5. If after 20 seconds you still don't hear a beep, refer to Chapter 3, Troubleshooting Guide.

6. Turn the power switch to the OFF position.

THE DISPLAY MONITOR

The Front of the Monitor

On the front of the monitor you'll find a power switch as well as two dials for controlling the contrast and brightness of the screen display.
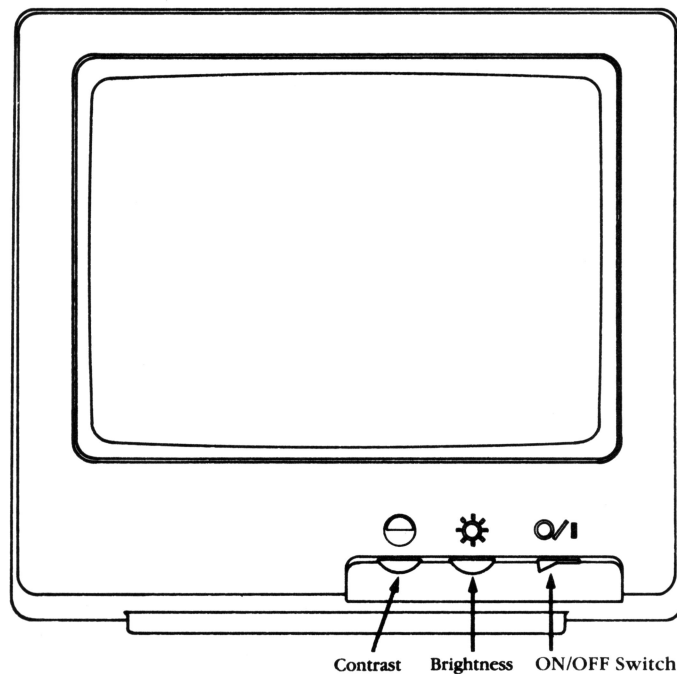
Figure 1-10   The Monitor

The Rear of the Monitor

The rear features of the monochrome and color monitors vary slightly. The monochrome monitor has two built-in cords that you plug into the system unit -- one for power and the other for video control.

The color monitor also has a cord for video control, but you must connect its power cable to both the monitor and the system unit.

Connecting the Display Monitor

1. Attach the video cord from the rear of the monitor to the appropriate 9-pin connector (MONO or COLOR) on the rear panel of the system unit.

   The connector on the end of the cord is labeled either MONO or COLOR. The connector fits into the system unit only when the label is up.

2. Tighten the screws on the connector so it won't fall out of the socket.
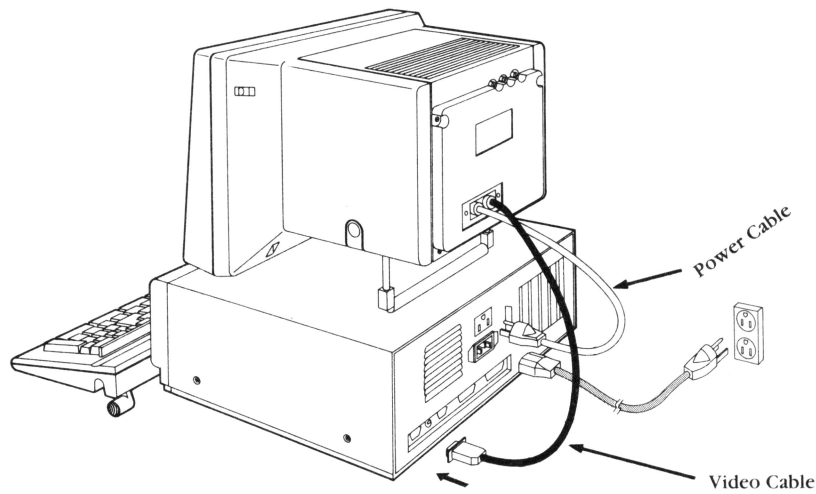
Figure 1-11 Connecting the Monitor

3. Set the monitor selection switch so it corresponds to the type of monitor you are using (M for MONO and C for COLOR).

   Note: If you ever change monitors and have to change the switch setting, you must also reset the system. For an alternative method to setting SW1, see the Appendix, SW1: Color/Monochrome Switch.
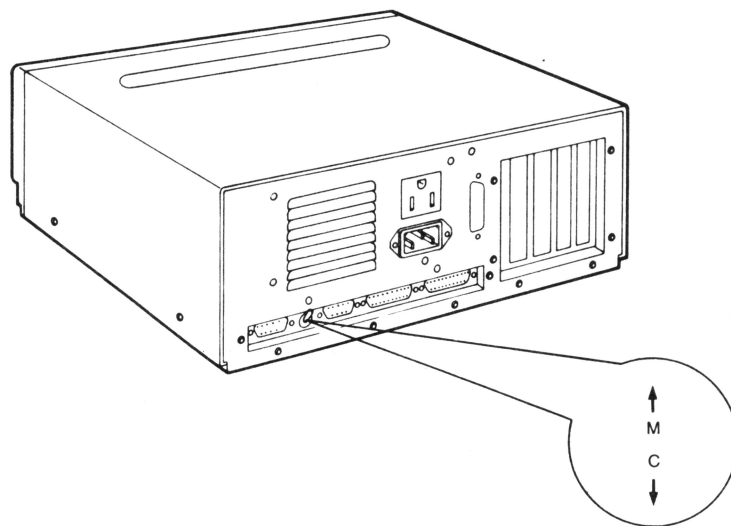
Figure 1-12 Monitor Selection Switch

4. Connect the power cable from the monitor to the monitor power receptacle on the rear panel of the system unit (see Figure 1-5).

THE KEYBOARD

The Model D features an 83-key, detachable keyboard that plugs into the front of the system unit.

The central keypad, modeled after the IBM Selectric® typewriter, includes all of the basic character and control keys.
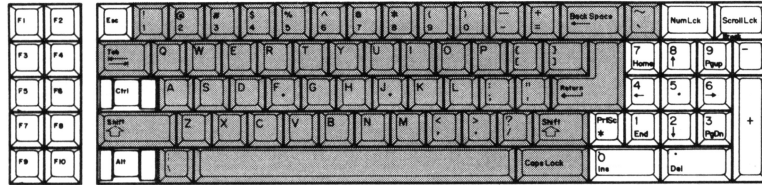
Figure 1-13 The Typewriter Keys

Flanking these standard typewriter keys are several keys that aid in writing, editing, and running programs. (Note that some of these keys are part of the central keypad but have been assigned special functions as well.)
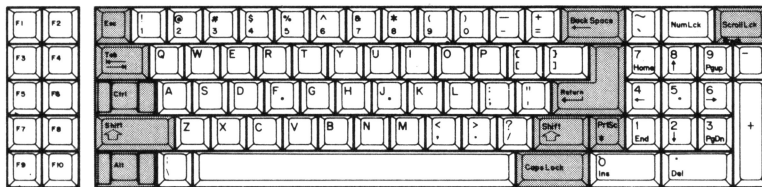
Figure 1-14 Keys for Writing, Editing, and Other Special Functions

On the right-hand side of the keyboard is a numeric keypad (0 through 9, with plus, minus, and decimal-point keys).
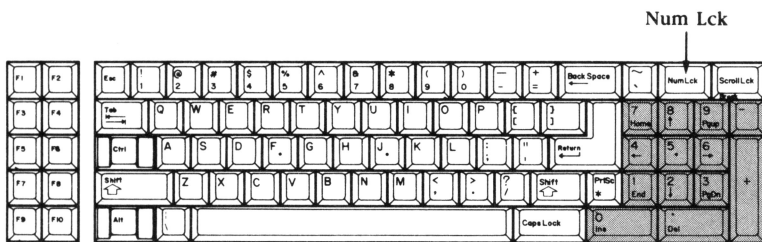
Figure 1-15 Numeric Keypad

You can use this keypad with NUM LOCK active or inactive:

o   To turn the NUM LOCK key on, press **NUM LCK.** The keys will create numerals and mathematical symbols. Most software programs indicate that **NUM LCK** is active by displaying the word NUM on the monitor screen.

o   To turn the NUM LOCK key off, press **NUM LCK** again. This turns off the numeric functions. The word NUM disappears from the screen and the keypad keys resume control of cursor movement and some major editing functions. When you first turn ON the system, the keypad is in this mode.

On the far left of the keyboard are the function keys (F1 through F10). These carry out commands that are built into MS-DOS and software programs.

Figure 1-16   Function Keys

Connecting the Keyboard

1.   Hold the keyboard cord so that it extends to the left as you face the front panel. This aligns the pins with the socket.

2.   Connect the keyboard to the system unit.
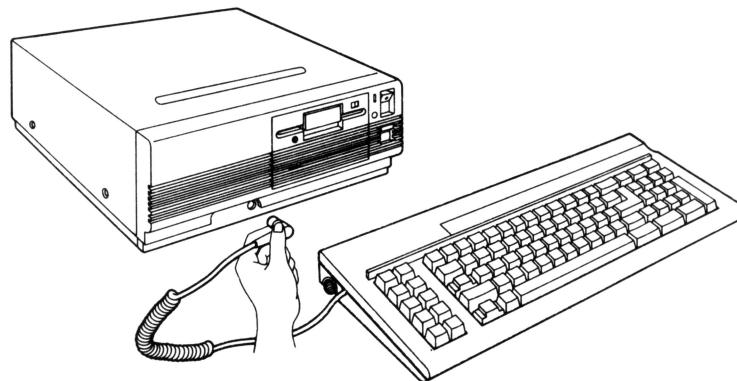
Figure 1-17   Connecting the Keyboard

CONNECTING A PRINTER (OPTIONAL)

The Model D works with a variety of printers and provides both serial and parallel connector ports on the rear panel of the system unit. Plug your printer's cable into the appropriately labeled slot. To set the printer's switches, refer to your printer manual. If you have a serial printer, you may need to change the DOS data transmission settings. Consult the MODE command in the *MS-DOS Reference Manual*.

GETTING STARTED

Once you have attached the monitor and keyboard to the system unit, proceed with the remaining steps in this chapter.

1. Turn ON the power switch at the front of the monitor.

2. Turn ON the power switch at the front of the system unit.

3. After a few seconds the following should happen:

   o   The ROM BIOS message appears on the display screen, and the memory self-test begins checking for defects in RAM.

   o   When the test is complete, the red light on Drive A lights up, indicating that the computer is attempting to read a disk in the drive.

   o   About 20 seconds after the light goes on, the following error message appears on the screen, indicating that there is no disk in the drive.

           Boot disk failure. Type key to retry.

   If anything else happens (e.g., more than one beep or no beep at all, or if a different error message appears on the display screen), follow these steps:

   o   Turn the system OFF.

   o   Check all cable connections.

   o   Check the connection with the wall outlet.

   If a problem persists, refer to Chapter 3, Troubleshooting Guide.

4. Insert the MS-DOS system disk into Drive A and close the drive door.

Caution

When inserting the MS-DOS disk (or any disk):

o   Handle the disk only by its plastic cover. Never touch the oval read/write window where the magnetic medium is exposed.

o   For insertion, hold the disk by the edge opposite the oval, with the label side up. Gently slide it into the drive horizontally until it stops.

o   If insertion is incomplete or incorrect, the drive door will not close. Do not jam it, but insert the disk again carefully.
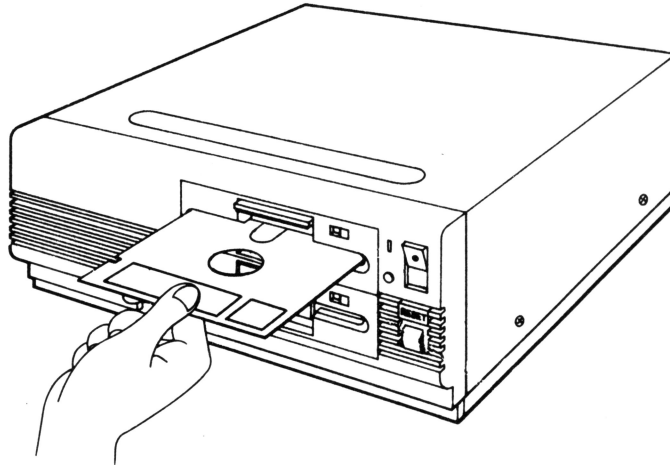
Figure 1-18 Inserting the MS-DOS Disk

5. Press the reset button on the front of the system unit.

Once MS-DOS is loaded, examine the screen and, if necessary, use the controls on the front of the monitor to adjust the display.

FINISHING SETUP

If every step has been successfully completed, the Model D is ready for use. At this point you should finish installing and cabling any accessories or internal system boards before proceeding with the next chapter.

If you have encountered problems, refer to Chapter 3, Troubleshooting Guide.

CHAPTER 2
GETTING STARTED WITH MS-DOS

LOADING MS-DOS

Before you can use your Model D, you need to load a disk operating system (DOS) into its memory so it can understand and carry out your instructions. The Model D comes with the MS-DOS operating system.

If you have a floppy-disk system, you must load MS-DOS every time you reset the system or turn the power on. If you have a fixed-disk system, you need to transfer MS-DOS to the fixed disk only once; it then remains resident in the system and is available for use whenever you turn on the computer.

To become familiar with MS-DOS, turn to the *MS-DOS User's Guide* that is included with the Model D. The guide takes up where these instructions leave off and explains in detail the MS-DOS functions that will run your system and software.

MS-DOS AND THE FLOPPY-DISK SYSTEM

Floppy disks can easily be damaged or erased by human error or by sudden electrical surges in a computer's power system. For this reason, do not use the MS-DOS Master disk for everyday operation. Use it only to make a working copy of MS-DOS. Chapter 4 of the *MS-DOS User's Guide* explains how to make a working copy on a floppy-disk system. Use the working copy, and store the Master disk in a safe place. Then if your working copy is ever damaged, you'll be able to recopy the MS-DOS files from the Master.

You can load MS-DOS into the floppy-disk system whether you begin with your computer on or off. Both versions of the procedure are described on the following page.

When you simultaneously start the system and load MS-DOS, you are booting the system. You can also restart the system and reload MS-DOS when the power is already on. This is called resetting the system. Both processes are finished when the screen prompts you for the current date and time.

Booting the System When the Power Is Off

1. Insert the MS-DOS working copy into Drive A and close the drive door.

2. Turn the power switch on. The red light on Drive A lights up, indicating that the system is reading the disk and loading MS-DOS into memory.

Resetting the System When the Power Is On

1. With the MS-DOS working copy in Drive A, press the reset button. An alternative method is to simultaneously press the **CTRL, ALT,** and **DEL** keys.

2. The screen display disappears and the red light on Drive A lights up, indicating that the system is reading the disk and loading MS-DOS into memory.

A system reset is also called a warm boot.

You can also use a warm boot to reset the computer under certain unusual conditions. For example:

o   If the computer stops operating normally while executing a program, and pressing **CTRL BREAK** has no effect.

o   If the system stops when you press the **PRTSC** key. (This indicates that the printer is not ready.)

If resetting does not solve the problem, turn the system unit OFF, wait 10 seconds, and then turn the power back ON.

SETTING THE DATE AND TIME

After MS-DOS is loaded into memory, the screen looks like the one in Figure 2-1. The blinking character is called a cursor and indicates your starting position.

The Model D has an internal clock that maintains the current time and date. Setting the clock correctly when you first use the computer will help you keep track of your work, as each file you open will be " stamped " with a record of when it was created.

```
Phoenix 8088 ROM BIOS Version X.XX
Copyright 1984, 1985 Phoenix Software Associates Ltd
All Rights Reserved

Compatibility Software
Copyright © 1984, 1985 by Phoenix Software Associates Ltd.

MS-DOS version 3.10
© Copyright 1981, 85 Microsoft Corp.

Command v. 3.10 © Copyright Microsoft Corp 1981, 1985

Current date is Wed 2-19-1986
Enter new date (mm-dd-yy):
Current time is 13:48:16.31
Enter new time:

A)
```

Figure 2-1 The First MS-DOS Screen

To set the date:

1. Type the month, day, and year in one of the following formats:

    MM-DD-YY
    MM/DD/YY
    MM-DD-YYYY
    MM/DD/YYYY

    If you make a mistake, press the **ESC** key at the top left of the keyboard. You can retype the date or go to the next step.

2. Press the **RETURN** key.

    A time indication and a prompt for the current time appear immediately below the new date.

To set the time:

1. Type the current time, using the format on the screen. Type the hour according to the 24-hour system, and use colons to separate the hour from the minute indication (for example, 12:15). Only the hour and the minute need be entered.

    If you make a mistake, press the **ESC** key at the top left of the keyboard. You can retype the time or go on to the next step.

2. Now press the **RETURN** key.

    After you have set the clock, the correct date and time will be displayed
    whenever you start the computer. Simply press the **RETURN** key at each
    prompt to confirm that the information is correct.

Note: The internal clock is supported by a battery backup that keeps it going
even when the computer is unplugged for up to 30 days. To ensure that the
battery backup is fully charged, leave the system unit turned on for 24 hours
when you first set up the computer. Turn the monitor off during this period.

THE MS-DOS PROMPT

Once you enter a valid date and time, the A> prompt appears. This means that
MS-DOS is ready to accept your next command.

The A> prompt also indicates that Drive A is the current drive. The computer
will always look in the current drive for the commands on the MS-DOS disk or
the filenames that you enter. You can change the current drive by typing in
another disk drive indicator.

For example, type **b:** and press **RETURN** to make Drive B the current drive; a B>
prompt appears on the screen. Typing **c:** and pressing **RETURN** gives you the C>
prompt and refers the system to the fixed-disk drive (Drive C), if your
computer has one.

A commonly used MS-DOS function is the Directory, or DIR, command. To see a
list of all the files in the current drive, start from the A> prompt:

1. Type: **dir**

    (You may type either uppercase or lowercase letters. MS-DOS interprets the
    command correctly in either case.)

2. Press **RETURN.**

MS-DOS AND THE FIXED-DISK SYSTEM

When setting up a fixed-disk drive, you can allocate all of the space for use
with MS-DOS or you can partition the space among different operating systems.
If you want to work exclusively with MS-DOS, follow the procedure outlined
below. However, if you intend to use other operating systems as well, refer to
Chapter 2 of the *MS-DOS Reference Manual*.

Formatting a Fixed Disk

The Diagnostics disk that comes with the Model D contains a command file called PREPARE.COM. This program formats the fixed disk for MS-DOS and then loads the operating system on it. In addition, the program looks for defective sectors on the disk, notes their locations, and hides them from the system. (All fixed disks have **some** bad sectors.) PREPARE makes sure your system does not lose any information by trying to record on these faulty areas of the disk.

To format and prepare the fixed disk for operation, follow this procedure:

1. Insert the MS-DOS Master disk in Drive A (this disk is supplied with the Model D).

2. Turn the power on.

3. Answer the date and time prompts (see Setting the Date and Time, earlier in this chapter).

4. When the A> prompt appears (see The MS-DOS Prompt, earlier in this chapter), replace the MS-DOS disk with the Diagnostics disk.

5. Type: **prepare**

6. Press the **RETURN** key.

    The following will appear on the screen:

        The Leading Edge Fixed Disk Preparation Program
        Version X.XX

        ****
        **   WARNING, WARNING, WARNING   **
        ****

        Fixed Disk Drive will be Formatted for MS-DOS
        ALL DATA WILL BE LOST
        Are you sure you want to do this?

7. Type **y** (yes) to continue (or press any other key to stop the PREPARE program).

    If you type **y** you will see the following screen message:

        Which Fixed Disk Drive unit do you wish to format (0 or 1)?

8. Type **0** to format the internal fixed disk.

   (If you have added a second fixed disk to your system, type **0** to format the first disk, and wait for the process to be completed; then type **1** to format the second fixed disk. If you press any key other than 0 or 1, the question will be displayed again.)

   You will see the following:

   ```
   Formatting ...
   ```

   The procedure takes about three minutes. The next message you see is:

   ```
   Verifying ...
   ```

   This part of the PREPARE program checks to see that the formatting has been carried out correctly and hides any defective areas on the disk.

   Then the screen reads:

   ```
   Hit any key to begin transferring system files
   to Fixed Disk Drive unit
   ```

9. When you press a key, the system begins transferring the MS-DOS system files from the Diagnostics disk to the fixed disk.

   You should see:

   ```
   Transferring System Files
   ```

   and then a message indicating that the format is complete.

Note: At this point, MS-DOS is only partially installed on the fixed disk. You have put the internal command files in the system, but you still need to copy the external files onto the fixed disk. Without these files, your system has only limited capabilities.

Chapter 6 of the *MS-DOS User's Guide* explains the internal and external commands, and Chapter 8 explains how to copy the external command files onto the fixed disk. For detailed information about both types of commands, see Chapter 5 of the *MS-DOS Reference Manual*.

Before proceeding any further, it is important that you make a working copy of the MS-DOS Master disk (Chapter 8 of the *MS-DOS User's Guide* explains how to make a working copy using a fixed-disk system).

ORGANIZING A FIXED DISK

Because a fixed disk has such a large storage capacity, it's essential that you create an orderly system for managing your files.

You can use MS-DOS to create a multilevel directory, arranging your files and programs in subdirectories and sub-subdirectories on the disk. The concept is similar to setting up a filing cabinet in which each drawer holds a specific type of information (e.g., personnel records might be in one drawer, accounts receivable in another, and correspondence in a third).

The first step in creating subdirectories is to decide how best to organize your work, and who, besides yourself, may need access to the system. Then you can group files according to common traits and specific uses.

Chapter 8 of the *MS-DOS User's Guide* explains how to create a multilevel directory.

QUICK-REFERENCE GUIDE TO MS-DOS (FOR FIXED-DISK USERS)

MS-DOS offers certain important functions to fixed-disk users. The table below and on the next page serves as a cross-reference guide to the two MS-DOS manuals that came with your Model D. If you have a fixed-disk system, be sure to read the sections listed, in both the *MS-DOS User's Guide and Reference Manual*.

IN THE MS-DOS 3.10 USER'S GUIDE:

Chapter	Title	Sections
8	More about Fixed-Disk Systems	Read entire chapter. Note especially: Setting Up a Partition for MS-DOS Using Directories Creating a Directory

Continued

IN THE MS-DOS 3.10 REFERENCE MANUAL:

CHAPTER 3
TROUBLESHOOTING GUIDE

The Leading Edge Model D may not always function the way it should. If you encounter problems, you can use diagnostics, or testing procedures, designed specifically for the Model D.

Diagnostics can pinpoint difficulties you may be having with your system. This chapter guides you through a series of observations and questions to help you zero in on technical problems. In some cases you perform the tests yourself, and in others, the Model D carries them out for you.

SOFTWARE TROUBLE

If you have trouble with your computer, first try to decide whether the problem stems from the software you are using (MS-DOS or applications such as word processing) or from the hardware (the components of the system).

To determine if the software is generating the error:

o   If you get an error message while using a particular software program, check the sections in the software manual covering problems, error messages, and troubleshooting.

o   On the other hand, an error message may come from MS-DOS. Compare any messages you get on your screen against the list in Appendix B of the *MS-DOS Reference Manual.*

If the software does not seem to be the source of the trouble, you can turn to the next section to begin checking your system's hardware.

PRELIMINARY DIAGNOSTICS

Normal Start-up Responses

Before you can determine whether or not your system is at fault, you need to know how it **should** function.

If your Model D is in good working order, it responds in the following way when you turn the power on, before you have loaded MS-DOS:

1. The power indicator lights up.

2. The cursor appears in the upper left corner of the monitor, and a message appears:

   ```
   Phoenix ROM BIOS Ver 2.XX
   Copyright 1984, 1985, Phoenix Software Associates, Ltd.
   All Rights Reserved
   ```

3. After this message, the RAM Test starts. In this self-test, all 256 kilobytes of the system's RAM are consecutively checked.

Note: You can shorten the RAM Test by pressing any key before it finishes.

4. About two seconds after the RAM Test stops, one short beep sounds. This indicates that the RAM Test has been successfully completed.

5. After the beep, the indicator on Drive A lights up.

6. About 20 seconds later, the following message appears:

   ```
   Boot disk failure. Type key to retry
   ```

7. The disk-drive light goes off.

Although the computer appears to be signaling an error, nothing is actually wrong. The Model D is indicating that there is no disk in Drive A from which to load the operating system. If you have reached this point, you can now go on to load MS-DOS (see Chapter 2) and start using the computer.

However, if your Model D did not start up properly, read the following sections on diagnostics.

Observation Tips

Throughout the following testing procedures, observe how the Model D behaves (or misbehaves). Study as precisely as you can what happens and keep notes:

o   What appears on the screen? Write down error messages and/or note any random characters or sentences that may be displayed.

o   Do any system lights (the power and disk-drive indicators) come on? Which ones? For how long? Do they flicker or stay lit?

o   Do the disk drives keep spinning? (When a drive is spinning, it makes a whirring sound.) Which one(s)? For how long?

TRY THESE STEPS FIRST

Step 1: Check Connections

o   Turn off the system unit.

o   Unplug the system unit from the wall.
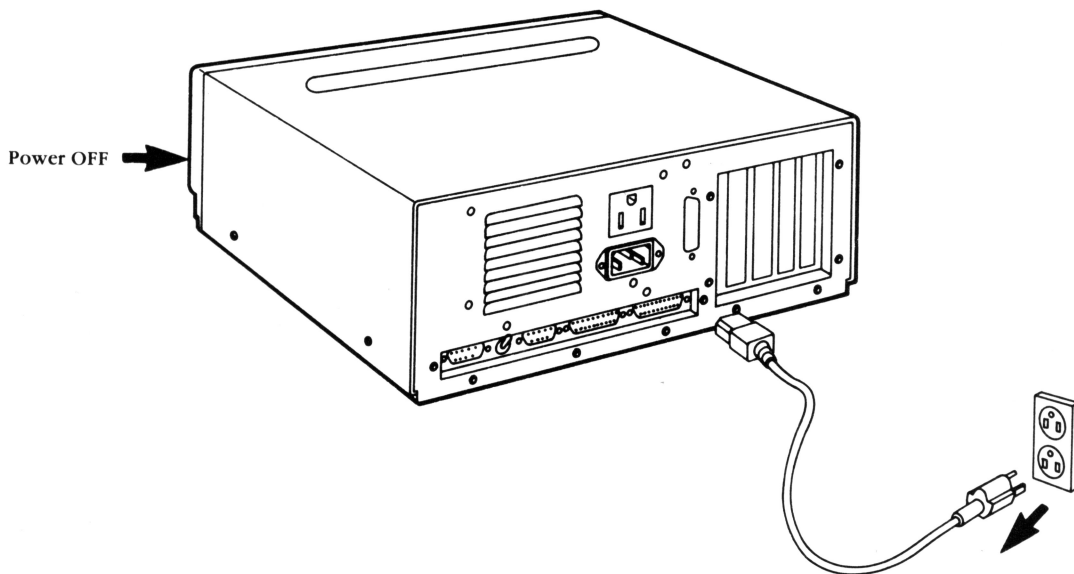
Figure 3-1 The System Unit Unplugged

o   Plug in a working appliance to be sure there is power from the wall outlet.

o   Remove and reinstall the keyboard cable. (See Figure 1-17.)

o   Remove and reinstall the two monitor cables -- video and power. (See Figure 1-11.)

o   Remove and reinstall the power cable from the system unit.

Step 2: Power On

o   Be sure the Model D is plugged into a working wall outlet.

o   Turn the system unit on.

o   Be sure the monitor is also on; it has a separate power control.

o   Take notice of any of the following:

Do any of the indicators on the front panel light up?

Is anything displayed on the screen? If so, observe it closely.
Adjust contrast and brightness with the controls at the front of your
monitor (refer to Figure 1-10) until you have the clearest image on the
screen.

If the screen does not display a prompt or other message when it
should, note what is missing and what is on the screen.

o   Keep notes on any sounds the computer makes.

o   If you miss the start-up responses, turn the power off, wait five
seconds, turn the power on again, and observe what happens.

SYMPTOMS, SOLUTIONS, AND WHERE TO TURN FOR HELP

The following pages depict start-up responses that indicate trouble with the
system. If your computer does not respond normally when you start it up, find
the symptom below that best matches your experience, and follow the
instructions there.

SYMPTOM

No screen display

Power indicator does not light up

No beep

No drive response
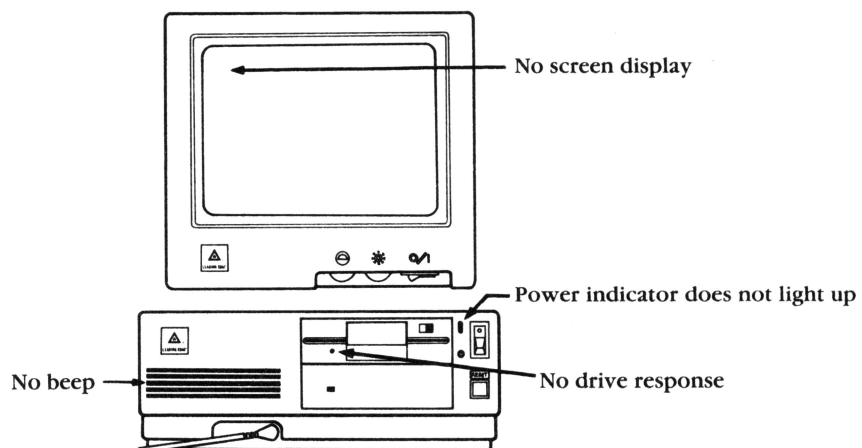
The system may not be receiving any power.

o   Make sure you turned the system unit on. (Check to be sure the monitor
    is also on.)

o   If the system unit is on, turn it off, wait five seconds, and turn it
    on again.

o   If once again the power indicator does not light up, recheck the power
    source and cable connections (refer to Step 1).

o   If the connections are secure and yet there is still no power when you
    turn on the computer, turn to Service Information.

SYMPTOM

No screen display

Power indicator lights up

No beep

No drive response
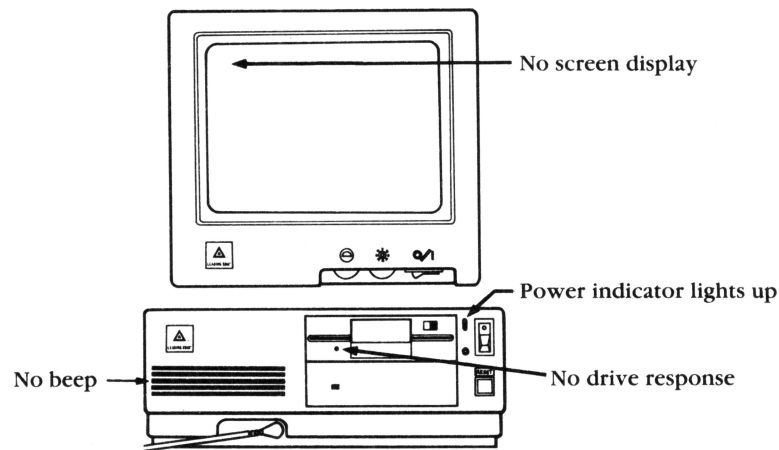
The system unit is probably the source of the problem.

o   Turn the system unit off, wait five seconds and turn it on again, or
    push the reset button on the front of the system unit.

o   This time if any responses other than the normal ones occur, turn to
    Service Information.

SYMPTOM

ROM bad chksum=xxh ——— This message appears

Power indicator lights up

No beep ——— No drive response
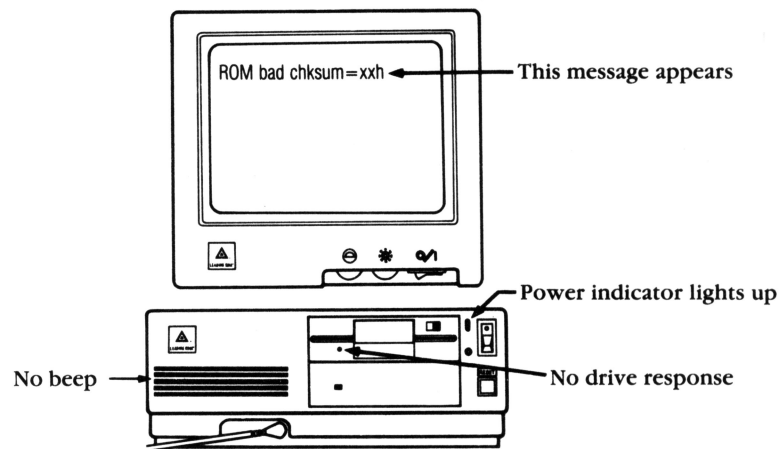
The message indicates the system ROM (read only memory) is faulty.

Turn to Service Information.

SYMPTOM

Mem Par NMI Int ——— This message appears

Power indicator lights up

No beep ——— No drive response
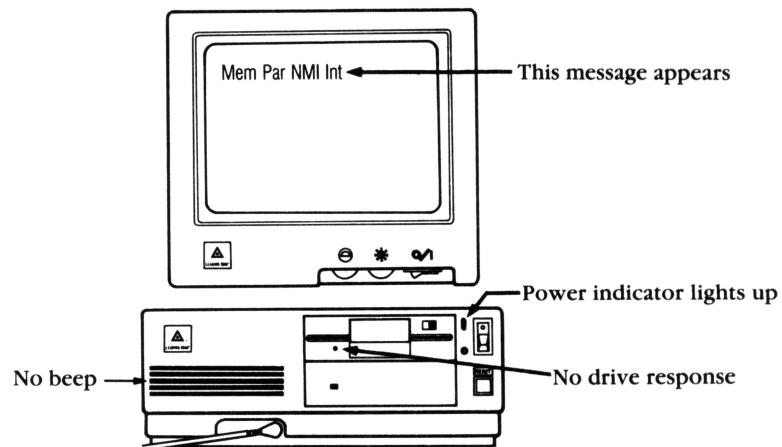
The message indicates either the system memory or the expansion memory (if you have installed it) is at fault.

o   Turn the system unit off, wait five seconds, and turn it back on. If the same message appears, some RAM is faulty and must be replaced.

o   Turn to The DIAGNOSE Program.

SYMPTOM

No scan code from keyboard ← This message appears

Power indicator lights up

One short beep →

No drive response; or drive light goes on and then off
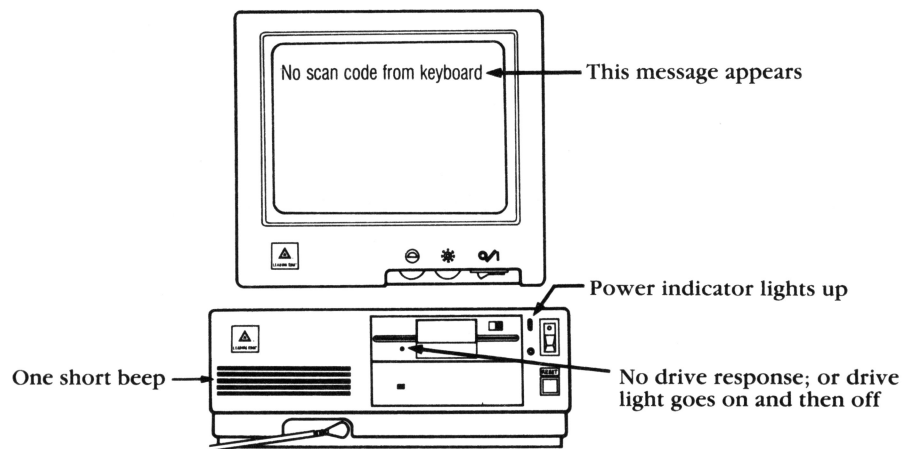
The problem is keyboard-related.

o   Turn the system unit off.

o   Remove the keyboard cable and reinstall it. (See Figure 1-17.)

o   Check the keyboard to see if a key is stuck. If so, release the key and turn the system unit back on.

o   If any other than the normal responses occur, turn to The DIAGNOSE Program. If you are unable to perform the diagnostic tests, the problem is probably within the keyboard or the system unit. Turn to Service Information.

SYMPTOM

Disk-related error message

Power indicator lights up

One short beep →

Drive light on for 20 seconds, then off
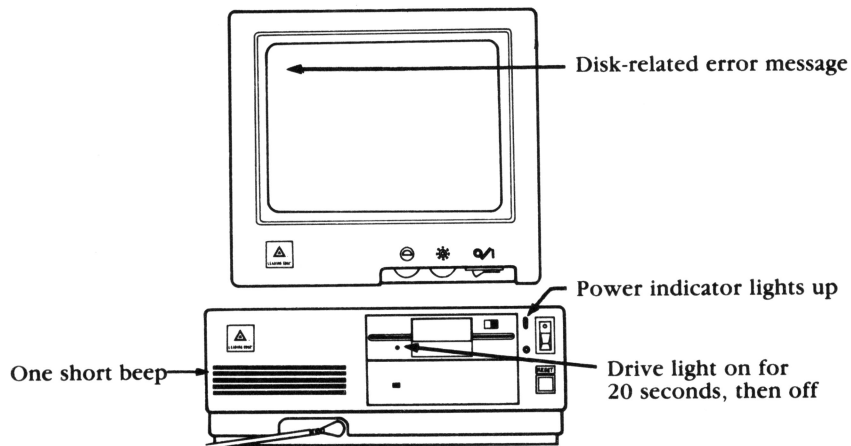
The screen message indicates a disk-related problem (see below).

Common Error Messages

Certain screen messages indicate disk-related problems (see the illustration above). Below are three disk error messages that are fairly common, especially for new computer users:

```
Boot disk failure. Type key to retry
```

This message indicates the system is unable to load MS-DOS. Be sure you have your working copy of the MS-DOS disk in Drive A. Check to be sure it is correctly inserted and that the drive door is closed. Press any key to try again.

If the message persists, your disk may be defective.

```
Bad or missing command interpreter
```

This message means MS-DOS is unable to find the COMMAND.COM file on the disk you are using. The file may have been overwritten by an MS-DOS program (for example, DISKCOPY) or an application program you used. Insert the MS-DOS disk or a copy of it in Drive A and press the reset button to restart the system.

```
Write-Protect Error
```

This message indicates you are trying to write information to a disk that is write-protected. Most floppy disks are notched so the computer can read from or write to them. If there is a write-protect tab covering the notch on the disk, you will have to remove it if you want to write to the disk.

Fixed-Disk Errors

A fixed disk or its internal controller board may occasionally present problems. If you get a disk error on your fixed-disk system, it is advisable to have the system unit serviced. Turn to Service Information.

Other Error Messages

If any error messages appear that are not mentioned here, refer to Appendix B in the *MS-DOS Reference Manual*. If you are running an application program when the message occurs, check the manual that came with the program.

SYMPTOM

bp‡xmΣrzqçΔ#‡bp‡xm   çΔ#‡ ←——— Screen has wrong or random characters

‡bp‡xmΣrzqç

Σr

qçΔ

#‡

zqçΔ#‡

Power indicator lights up

One short beep ——

Drive light on for 20 seconds, then off
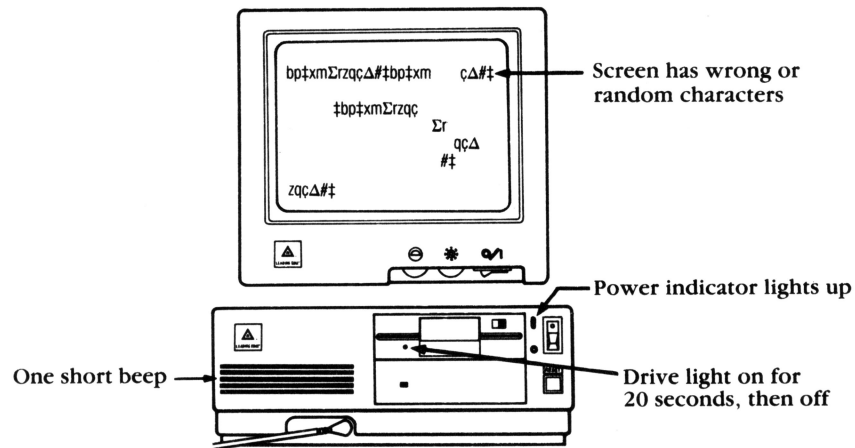
This could mean that the disk is defective or the system board is not working properly.

If you have another copy of the MS-DOS disk, insert it in Drive A and press the system reset button. If your screen still does not respond correctly, the system unit is probably the source of the problem, not the disk. Turn to Service Information.

SYMPTOM

No screen display

Power indicator lights up

One short beep ——

Drive light on for 20 seconds, then off
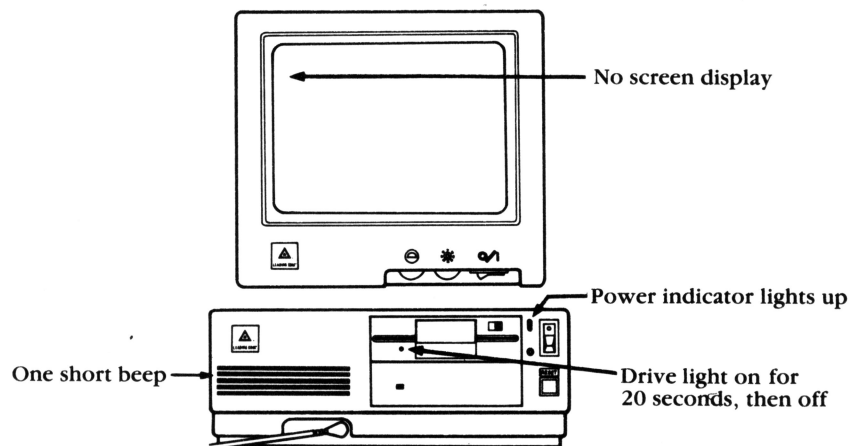
This indicates a problem with the monitor.

Turn to Solving Monitor Problems.

SYMPTOM

Obvious display problems—
shadows, rolling screen, etc.

Power indicator lights up

One short beep

Drive light on for
20 seconds, then off
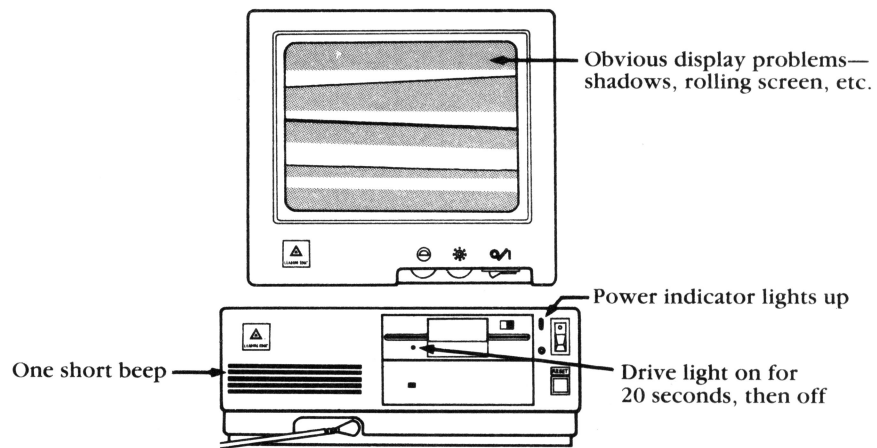
The controls on your monitor may need adjustment.

Turn to Solving Monitor Problems.

SYMPTOM

Screen has wrong or no color

Power indicator lights up

One short beep

Drive light on for
20 seconds, then off
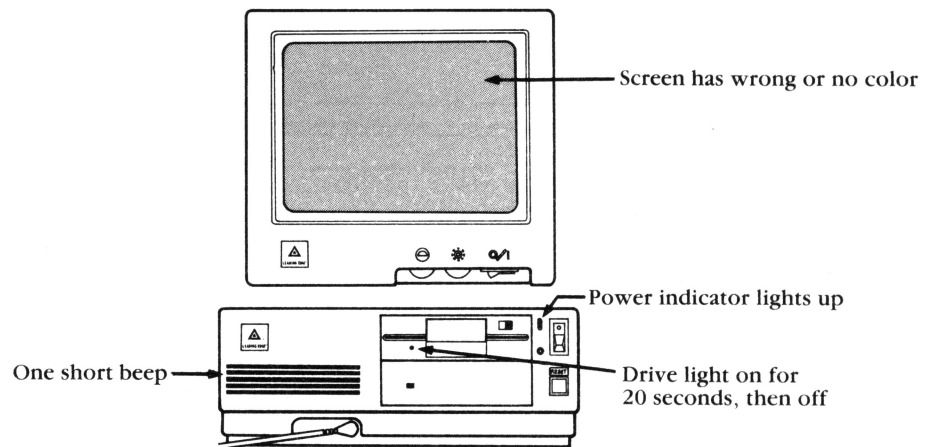
This applies to a color monitor only. Turn to the appropriate section under Solving Monitor Problems.

Caution

Opening the monitor case is not recommended. The monitor contains high-voltage components that can cause shock or fire, particularly if exposed to moisture.

SYMPTOM: Blank Screen

If your screen shows no display, read through the following section to find a solution to the problem.

Check Monitor Power. Note that the Model D monitor has its own power switch, separate from the system unit (see Chapter 1, Figure 1-10). Is the monitor turned on?

Check the System Unit. Check to be sure you turned the system unit on.

Check Monitor Cords. Are both the video and power cords connected securely? If not, turn off the monitor and system unit. Check to be sure that the video cables are attached to the correct socket (color cable to color socket, monochrome cable to mono socket). Refer to Figure 3-2.

Also check that the monitor selection switch (SW1) on the back of the system unit is set for the type of monitor you are using.
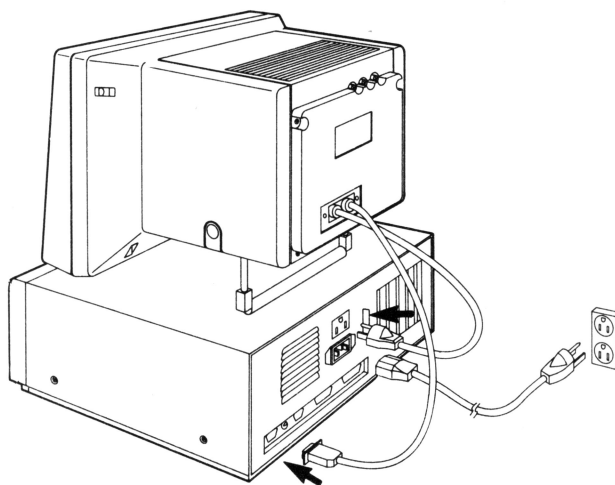
Figure 3-2 Video and Power Cable Connections

Adjust Contrast and Brightness Controls. Another cause of a blank screen may be improperly adjusted monitor controls.

Refer to Figure 1-10 in Chapter 1 for the location of these controls. Turn both control dials fully clockwise. Do any characters or the cursor now appear on the screen? If so, your monitor should now be in good working order.

If your screen still shows no response, have the monitor serviced. See Service Information. If you continue to get no screen display, the trouble probably stems from the system unit.

SYMPTOM: Distorted Screen Display

If the display on your monitor is distorted in some way, select the description below that best matches your experience.

Vertical Rolling. If your screen display is rolling, locate the HOLD control on the back of the monitor. (See Figure 3-3.) Use a small screwdriver to turn it in either direction:

If the screen is rolling **downward,** turn the control clockwise.

If it's rolling **upward,** turn the control counterclockwise.
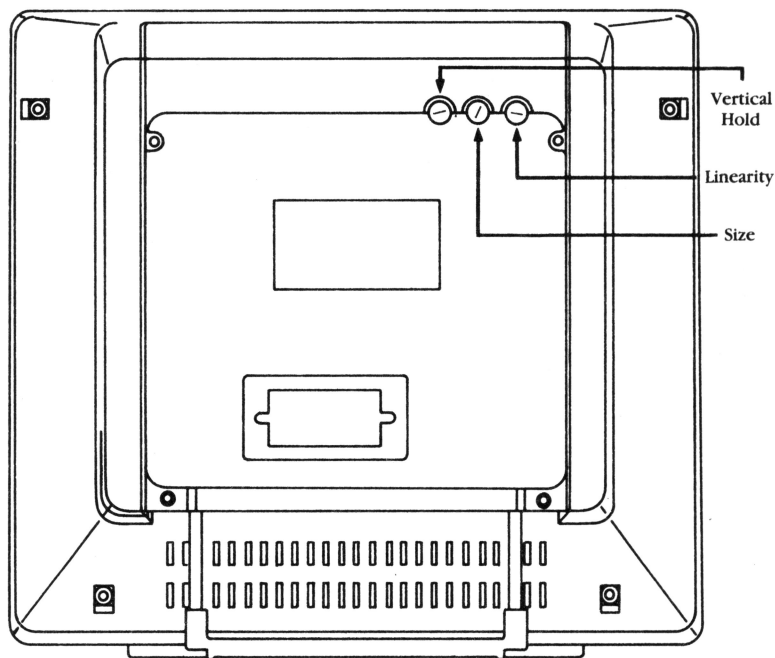
Figure 3-3 Rear Monitor Controls

Random Screen Display. Are there inappropriate or random characters on your screen?

Try to determine if the floppy disk you are using is defective. If you have another copy of the disk, insert it and press the system reset button.

If the disk does not seem to be at fault, turn the monitor and system unit off and recheck the cable connections.

If the procedures above do not solve the problem, there may be a defect in the system board. Turn to Service Information.

Interference. Your TV or radio can conflict with the display on your monitor. Likewise, a computer can interfere with television or radio reception.

If you suspect interference, turn the TV or radio off and on while observing the monitor. Does the screen reflect a difference?

If so, try each of the following steps.

o   Reorient the antenna for your TV or radio.

o   Relocate the Model D with respect to the TV or radio.

o   Plug the computer into a circuit separate from that of your TV or radio.

If these measures do not clear up the interference, contact your dealer or an experienced TV/radio technician for additional suggestions.

Note: For more information, send for the booklet *How to Identify and Resolve Radio-TV Interference Problems*, Number 004-000-034504, available from the US Government Printing Office, Washington, D.C. 20402.

Distorted Color. If the display on your color monitor is not right, experiment with the contrast and brightness controls on the front of the monitor. These let you adjust the hues slightly.

PRINTER PROBLEMS

You may have any one of several different printers connected to your Model D. If the following general advice does not solve your printer problem, consult the guide that came with the printer for more in-depth diagnostic procedures.

Caution

Always turn the printer and the system unit off before removing the printer cable.

Check the following:

o   Is the printer plugged in?

o   Check the wall outlet where the Model D and the printer are connected. After making sure that the plug is firmly in place, try a working appliance in the same outlet to be certain you have power.

o   Is the printer cable properly connected to both the printer and the system unit?

o   Starting from the MS-DOS prompt, hold down **SHIFT** while you press the **PRTSC** key. This should send a copy of what is on your screen to the printer. If you do get a print-out, this indicates that your computer is communicating with the printer.

o   If any lights on the printer control panel do not work, have the printer serviced.

Select from the list below the symptom that best describes the problem and try the recommendations there. If you are unable to correct the trouble yourself, turn to your printer manual and perform the self-testing procedures and any other diagnostic testing covered there. Remember to turn on the printer to perform those tests.

SYMPTOM: Some data not printed

Was the printer power turned off at any time when the system unit was sending information to the printer?

If so, turn the printer power on and try again.

SYMPTOM: Pale printed copy or none at all

o   Be sure the printer ribbon has ink and is installed properly.

o   Disconnect the printer cable and then reconnect it. If problem persists, see the printer manual.

SYMPTOM: Printer beeps and paper runs off track or jams

Is the printer cable securely connected at both ends?

Check for the following common problems:

o   The paper may not be correctly aligned.

o   There may be obstructions in the form-feed path.

o   The tractors may not be properly adjusted. Are they too far apart or too close together?

If the problem continues, see the printer manual.

SYMPTOM: Screen displays printer error messages

o   Turn the printer off and on again to clear the buffer.

o   Check the printer cable to be sure it is connected securely.

Checking the RS-232C Cable

You may have been using an RS-232C cable to connect a peripheral device to your Model D. If the device is not working, the problem may stem from the cable. Try the following before you consult the manual that came with the device you are cabling:

o   First check that the cable is secured well to both the system unit and to the device at the other end.

o   Often the connecting pins are plugged in incorrectly.   Carefully check them.

SERVICE INFORMATION

Once you have decided to have your Model D or one of its components serviced, follow these steps:

1. If you have a fixed-disk system, be sure to park the heads first (see Chapter 4).

2. Turn off the system unit and all components.

3. Unplug the power cord from the wall outlet.

4. Take your system to the dealer or service center, along with your notes describing the Model D's performance and any error messages displayed.

THE DIAGNOSE PROGRAM

The Diagnostics disk that comes with the Model D contains a program called DIAGNOSE. Designed specifically for the Model D, it tests the components of the computer -- the system unit, keyboard, monitor, and the printer ports. Following are instructions on how to run the DIAGNOSE program.

Preliminary Steps

1. Turn the system unit off.

2. Make sure that the monitor, keyboard, and printer or communications device are securely connected to the system unit.

3. Open Drive A and insert the Diagnostics disk.

4. Close the drive door.

5. Turn on the system unit, the monitor, and the printer, if you have one. The DIAGNOSE program loads automatically.

Note: You can load the DIAGNOSE program when the system is already on. At the A> prompt, insert the Diagnostics disk in Drive A and close the drive door. Type **diagnose** and press **RETURN**.

Following the DIAGNOSE Program

With the exception of the monitor test screens, the DIAGNOSE screens are arranged according to the layout in Figure 3-4.

```
┌─────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────┐  │
│  │ 00:43:44  07-04-85   LEADING EDGE DIAGNOSTICS PROGRAM │  │
│  │ Version X.XX                              │  │
│  │                             error  messages │  │
│  │ ─────────────────────────────────────────── │  │
│  │                                           │  │
│  │                                           │  │
│  │               active screen area          │  │
│  │                                           │  │
│  │                                           │  │
│  │               valid keystrokes            │  │
│  └───────────────────────────────────────────┘  │
└─────────────────────────────────────────────────┘
```
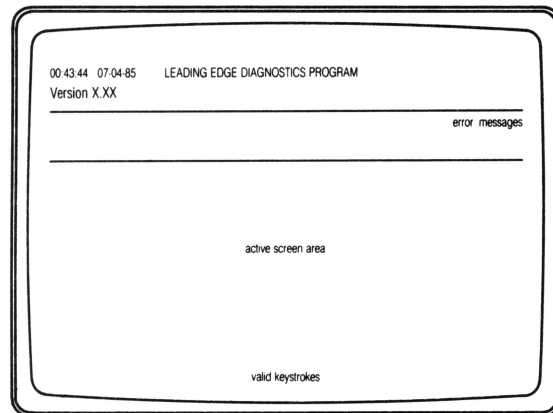
Figure 3-4 Screen Layout in the DIAGNOSE Program

The terms active screen area, error messages, and valid keystrokes in this section refer to the screen layout shown above.

System Components

The DIAGNOSE program first checks your Model D to see what components you have and then displays a list of them. The possible entries in the list are as follows:

keyboard
time-of-day-clock
amount of system memory
monitor mode (color or monochrome)
number of floppy-disk drives
number of fixed-disk drives
number of parallel communication ports
number of serial printer ports
presence of numerical data processor

Check the list very carefully. If any of it is incorrect, press **ESC** to stop the program. The next screen gives you the opportunity to make corrections or to return to MS-DOS.

If the list is correct, press **EXECUTE** to continue. The **EXECUTE** key is the large + key on the right-hand side of your keyboard. If you press any other key, the speaker beeps and the following error message appears:

You have not hit a valid Key!!

The Diagnostic Functions Menu

After the hardware checklist, the screen displays a menu of 10 diagnostic tests. Each test is invoked by pressing the corresponding function key on the left-hand side of your keyboard. By pressing the **F9** key, you can run all the tests consecutively.

At the end of each test the program returns you to the diagnostic menu. When you finish using DIAGNOSE, you can return to the MS-DOS prompt by pressing **ESC**.

Each test is described below.

TOD Clock (F1)

This test makes sure that the time-of-day clock chip is free of defects. When the test is over, the screen displays either:

TOD Clock Test Passed or TOD Clock Test Failed

You are then asked to press **EXECUTE** (the + key) to continue.

Keyboard (F2)

This test checks that all of the keys on the keyboard are working properly and that they can communicate with the computer.

The active screen area displays the layout of the keyboard as shown below.

```
■ ■   ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
■ ■   ■ ■ ■ ■ ■ ■ ■ ■ ■ ■   ■ ■ ■ ■
■ ■   ■ ■ ■ ■ ■ ■ ■ ■ ■ ■    ■ ■ ■ ■
■ ■ ■   ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
■ ■ ■ ■       ■           ■   ■ ■
```
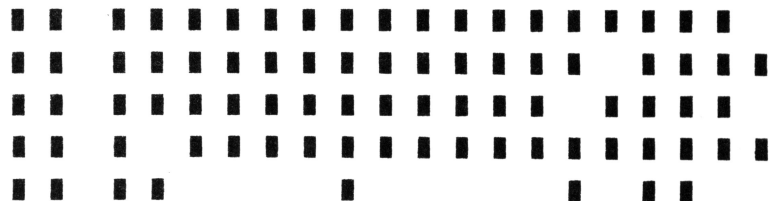
Each block represents a key. When you press a key to test it, the corresponding block is replaced with a letter or number that represents the key.

After you have pressed all of the keys, the screen should look like this:

```
1   2     e   l   1   2   3   4   5   6   7   8   9   0   -   =   b   `       n   s
3   4     t   Q   W   E   R   T   Y   U   I   O   P   [   ]           7   8   9   -
5   6     c   A   S   D   F   G   H   J   K   L   ;   '           r   4   5   6
7   8     ^       Z   X   C   V   B   N   M   ,   .   /   ^   *   1   2   3   +
9   0     a   \                   S                       c       0   .
```

If there are any blocks left up on the screen, there are two
possibilities: either you have not pressed all the keys, or the remaining
blocks represent keys that are not working properly.

You can exit this test only by holding down the CTRL key and pressing F1.

Printer (F3)

This test verifies that your computer can communicate with a parallel
printer. Although it is not a complete test, it does check to see if your
cable is faulty and makes sure the LPT (parallel) printer port is working.

If you do not have a parallel printer, you do not need to run this test.
If you have a serial printer or communications device attached to the
serial port, move on to the next test (F4).

First you are asked to choose the LPT port you want to test. Use the arrow
keys on the right-hand side of your keyboard to move to your choice. If
you have just one parallel printer connected in the standard port, select
LPT1 and then press **EXECUTE.**

A test pattern appears in the active screen area, and then the entire
screen is printed. Compare the printer output to the screen and note any
differences.

Note: If you do not have an IBM-compatible printer, the dashes are printed
out as a similar character, ASCII 196. Check your printer manual for more
information.

If there is a problem, the speaker beeps and an error message appears:

    PRINTER ERROR Check Connections

This can mean any of the following:

o   You do not have a parallel printer connected.

o   The printer cable is defective.

o   The printer is either turned off or it is off-line (see the printer manual).

o   The printer is faulty.

o   The printer port is defective.

You can try to print again by pressing **EXECUTE**, or you can stop the test with **ESC**.

Communications Chip(s) (F4)

This test checks the 8250 asynchronous communications controller chip, which controls the serial port.

The test runs through five screens that let you select certain parameters: the baud rate, parity, number of stop bits, word length, and the COM port. As in the parallel printer test (F3), you select each parameter from a list, using the arrow keys on the right side of the keyboard.

You can test up to three serial ports, but if your system has just the standard serial port, select COM1.

The active screen area displays one of the following messages:

```
THERE WERE NO ERRORS ENCOUNTERED IN TEST
TIMEOUT ERROR!   NO CHARACTER RECEIVED
TIMEOUT ERROR!   NO CHARACTER TRANSMITTED
OUTPUT SIGNALS AND INPUT SIGNALS DO NOT MATCH
FRAMING ERROR HAS OCCURRED
PARITY ERROR HAS OCCURRED
OVERRUN ERROR HAS OCCURRED
BREAK ERROR HAS OCCURRED
RECEIVED CHARACTER AND TRANSMITTED CHARACTER DIFFER
```

With the exception of the first message, all of the above show that some type of error has occurred during the test. Due to the interdependence of the serial port and whatever device you have connected there, it may be difficult to decide where the error lies. If you can, test another serial device in the port. If it works, have the first device serviced.

The test continues to run until you press **ESC** to stop it entirely or **EXECUTE** to begin the test over again.

Monitor (F5)

The monitor port can be tested in the monochrome mode, the color mode, or both. Select the test that fits your system, and press EXECUTE. The tests for each mode are described below.

Note: If the monitor fails any of the tests below, you should have it serviced. Turn to Service Information.

Monochrome Mode. This test consists of five parts, as follows:

1. Screen Memory Test

    This portion of the test verifies that the display memory can be written to and read from properly.

    If the memory passes, a message appears:

    SCREEN MEMORY TEST PASSED

    Press any key to continue to the next test.

    If the memory is faulty, the message reads:

    SCREEN MEMORY TEST FAILED

    At this point, press any key to stop the program, since the rest of the test is unreliable due to bad memory.

2. 80-Column Character Test

    This test displays the 256 ASCII characters in 80 columns.

    Press any key to continue to the next test.

3. Attribute Test

    This test displays all attributes available with monochrome mode. Adjust the contrast and brightness controls on your monitor so that the HIGH INTENSITY text is brighter than the NORMAL text.

    Check to see if the BLINKING text is blinking, the UNDERLINED text is underlined, and the REVERSED text is reversed.

    Press any key to proceed to the next test.

4. Alignment Test

    This test displays a grid that takes up the entire screen. If the pattern is not square and centered, use the rear monitor controls to adjust size and alignment.

    Press any key to proceed to the next test.

5. 720x348 Graphics Test

The triangular Leading Edge logo is displayed with Monochrome Graphics at the top of the screen and Hit Any Key at the bottom. Press any key to leave the monitor test and return to the diagnostics menu.

Color Mode. This test consists of ten parts, as follows:

1. Screen Memory Test

This portion of the test verifies that the display memory can be written to and read from properly.

If the memory passes, a message appears:

SCREEN MEMORY TEST PASSED

Press any key to continue to the next test.

If the memory is faulty, the message reads:

SCREEN MEMORY TEST FAILED

At this point press any key to stop the program, since the rest of the test is unreliable due to bad memory.

Press any key to continue to the next test.

2. 80-Column Character Test

This test displays the 256 ASCII characters in 80 columns.

Press any key to continue to the next test.

3. Color Test

In this test all 16 colors are displayed and named in text mode. Adjust the brightness and color controls on your monitor to achieve the labeled colors.

Press any key to proceed to the next test.

4. Alignment Test

This test displays a grid that takes up the entire screen. If the pattern is not square and centered, use the rear monitor controls to adjust size and alignment.

Press any key to proceed to the next test.

5. 80-Column Paging Test

   Press any key to start filling pages. The screen fills with the
   message:

   THIS IS PAGE ?

   After a short pause the program increments the page value and then
   displays the next page. There are four pages in all. Press any key to
   proceed to the next test.

6. 40-Column Character Test

   This test is similar to the 80-column character test except that the
   characters that fill the 40 columns are twice as wide.

   Press any key to proceed to the next test.

7. 40-Column Paging Test

   This test is similar to the 80-column paging test except that the
   characters are twice as wide and there are eight pages in all. Press
   any key to proceed to the next test.

8. 320x200 Graphics Test

   This test begins by displaying the first of four, four-color palettes.
   Press any key to advance through them sequentially.

   Then press any key to proceed to the next test.

9. 640x200 Two-color Graphics Test

   This test displays two colors (white and black).

   Press any key to proceed to the next test.

10. 640x200 16-color Graphics Test

    This test displays all 16 colors available in this mode.

   Press any key to return to the diagnostic menu.

Memory (F6)

This test checks the amounts of system board memory and any expansion board
memory you may have installed. During the test the clock display in the
upper left-hand corner of the screen stops. It starts again when the test
is over.

At the end of the test one of the following messages appears:

MEMORY TEST PASSED or MEMORY TEST FAILED

If errors were found in the installed memory, a memory chip map appears, similar to the one below:

```
          0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | P
          |   |   |   |   |   |   |   |   |
BANK 0    |   |   |   |   |   |   |   |   |
BANK 1    |   |   |   |   |   |   |   |   |
BANK 2    |   |   |   |   |   |   |   |   |
BANK 3    |   |   |   |   |   |   |   |   |
BANK 4    X | X | X | X | X | X | X | X | X
BANK 5    |   |   |   |   |   |   |   |   |
BANK 6    |   |   |   |   |   |   |   |   |
BANK 7    |   |   |   |   |   |   |   |   |
BANK 8    |   |   |   |   |   |   |   |   |
BANK 9    |   |   |   |   |   |   |   |   |

        REPLACE THESE CHIPS!
```

The map above is a representation of your system memory. If the program finds a faulty chip, the corresponding slot in the chart is filled in with an **X**. Note that if a complete row of the chart is filled with X's, it is very unlikely that all those chips are bad; it probably indicates a fault in other circuitry on the board.

BANK 0 is the first bank on the system board, and BANK 9 is the last bank of optional memory that can be installed. Note that these bank numbers refer to segment addresses, not the physical memory banks on the system board. The numbers across the top of the chart correspond to the individual data and parity bit chips within a bank of memory.

Whether the memory test has passed or failed, press **EXECUTE** to continue.

Floppy Drive(s) (F7)

For this test you will need one or two formatted disks that you can use freely without destroying valuable data.

Before the test begins, remove the Diagnostics disk from Drive A and insert an expendable disk in each drive you want to test.

If your system has a single floppy-disk drive (as in the standard fixed-disk model), the test immediately begins testing that drive. If you have the dual-floppy system, you must select Drive A, Drive B, or both drives.

Note: You can press **ESC** at any time to stop the test.

The drive you choose is tested immediately; if you select both drives, the test begins with Drive A.

First the test checks the spindle speed on the drive. The motor that makes the disk rotate must be spinning at a predetermined rate so that disks can be read correctly. When this check is completed, one of the following messages is displayed:

    DISK SPEED TEST PASSED or DISK SPEED TEST FAILED

Press **EXECUTE** to continue or **ESC** to stop the test.

The random read/write test is next. This verifies that the computer can write to and read from the disk in the drive. During the test, the active screen area notes the drive, head, track, and sector value that is currently being checked. It also reports each function as it proceeds (writing, reading, verifying).

Now press **EXECUTE** to go to the next drive (if you are testing both) or **ESC** to leave the test.

After Drive B has finished testing, you are asked to swap the disks in drives A and B. This part of the test checks that both disk drives can read disks written to by either of the drives. Press **EXECUTE** to start this compatibility test or **ESC** to leave it.

If you get an error message during the test, you will be asked to make a choice:

1. You can press **ESC** to stop the test entirely.

2. Or you can press **EXECUTE** to start the test over at the beginning of the track that is currently being tested.

The following is a list of the error messages that could appear:

    BAD NEC COMMAND
    DMA BOUNDARY ERROR
    MISSING ADDRESS MARK
    CRC ERROR
    WRITE PROTECT ERROR
    FAULTY NEC765
    RECORD NOT FOUND ERROR
    SEEKING ERROR
    DMA TRANSFER ERROR
    READ WRITE COMPARE ERROR

Fixed-Disk Drive (F8)

Note: If you do not have a fixed-disk drive in your system, you cannot run this test. If you want to test the floppy drive in your fixed-disk system, turn back to the previous test, F7.

The fixed-disk test is similar to the one that tests the floppy disk, except that it does not affect the fixed disk itself or any data on it. The first screen gives you an estimate of the time the program will require to accomplish the test (approximately 15 minutes for the 10-megabyte disk and 30 minutes for a 20-megabyte disk). Press **EXECUTE** to continue or ESC to stop.

If you have one fixed disk installed in your system, the test immediately begins testing it.

If you have more than one fixed disk, you must select which drives you want tested: HARD DRIVE 0 (Drive C), HARD DRIVE 1 (your second fixed disk), or both drives consecutively. The test begins immediately.

The first part of the test checks the sector buffer RAM and the internal hardware of the fixed-disk controller.

Messages are displayed as follows:

    RAM Diagnostics PASSED or RAM Diagnostics FAILED

and then:

    Controller Internal Diagnostics PASSED
    or
    Controller Internal Diagnostics FAILED

If either of the two tests fails, an error message appears. Press either **ESC** or **EXECUTE** to stop the fixed-disk drive test.

No subsequent part of the fixed-disk test can be carried out without the successful completion of these two tests.

If both of the above tests passes, the verifying check begins. This attempts to read every sector on the fixed disk.

A tally of bad sectors is kept and displayed after all the sectors have been checked. You can exit the verifying test by pressing **ESC**.

Note: If the test finds bad sectors on your fixed disk, do not jump to the conclusion that there is a problem with your fixed-disk drive. All fixed-disk drives contain some faulty sectors, but these are safely hidden from the system (not used).

Next a short write test is performed in a protected area of the disk to assure that the write circuitry is working. The test displays one of the following messages:

READ/WRITE Test PASSED or READ/WRITE Test FAILED

Press **EXECUTE** to continue or **ESC** to stop.

If an error arises in any part of the test, an error message is displayed. At this point, press **ESC** to stop the test entirely or press **EXECUTE** to continue to the next sector. Possible error messages include the following:

```
UNKNOWN ERROR CODE
No Index Signal from Drive
No Seek Complete Signal from Drive
Write Fault Signal Received from Drive
Drive not Ready
Track 00 not Found
ID Field Read Error *
Uncorrectable Data Error in Data Field *
Sector Address Mark not Found *
Target Sector not Found *
Seek Error *
Correctable Data Error
Track is Flagged Bad *
Invalid Command
Illegal Disk Address
Illegal Parameter
RAM Error
Program Memory Checksum Error
ECC Polynomial Error
```

*   These errors are caused by bad sectors. They increase the faulty-sector tally mentioned earlier.

If you see Correctable Data Error, this means the test encountered an area on the disk that had an error but it was able to correct it.

The last three errors on the list result only from the RAM Diagnostic Test or the Controller Internal Diagnostic Test.

If your system does not encounter any errors during normal use, then do the following:

Run the fixed-disk drive test and keep a record of the bad sectors that it finds. If you later suspect something is wrong, you can check to see if the test finds any sectors that were not on your original list.

You should make a new list every time you format your fixed-disk drive.

Test All (F9)

This function lets you run all the tests without having to press each function key individually. The individual tests are carried out in the order they appear on the menu.

Park Fixed-Drive Heads (F10)

"Parking" the fixed drive is a way of securing the extremely fragile heads that read from and write to the disk.

WARNING

You must park the fixed-drive heads whenever you are preparing to move your system unit, even if it is just to the next room.

The F10 function is one of two methods of accessing the PARK program on the Diagnostics disk. An alternate method is described in Chapter 4, Moving the Model D.

The F10 function will not work if you do not have a fixed drive in your system.

After selecting **F10**, a message appears:

The Fixed Drive heads will be moved to the shipping zone

Press **ESC** to return to the menu or press **EXECUTE** to proceed.

Next your screen reads:

EXECUTING PARKING PROCEDURE . . .

When you see the message:

THE HEADS HAVE BEEN PARKED. YOU CAN TURN THE SYSTEM OFF NOW!!!

the process has been completed. When you turn the system back on, the heads are unparked automatically.

SUMMARY

You have come to the end of the diagnostic procedures. If your Model D has passed all the tests, it is ready to start working for you.

At this point, if your system is not operating properly, contact the dealer from whom you purchased your Model D for additional help, or refer to the next page for how to get telephone support from Leading Edge.

TELEPHONE SUPPORT

If you need further help, you can call Leading Edge Hardware Support. Outside Massachusetts: 1-800-343-6857, ext. 3800; within Massachusetts: 1-617-828-8150, ext. 3800.

CHAPTER 4
MOVING THE MODEL D

WARNING

If your computer is equipped with a fixed-disk drive, you are strongly urged to use the PARK.COM program on the Diagnostics disk before you move the system from its original location. Instructions follow.

THE PARK PROGRAM

The PARK program on the Diagnostics disk repositions the read/write heads in the fixed-disk drive. This is called " parking " the heads.

Parking the heads protects them from harm and keeps them from damaging the magnetic surfaces of the fixed disk. **Always** run the PARK.COM program before you transport the system unit.

Note: The heads can also be parked through a function in the DIAGNOSE program. See the instructions at the end of Chapter 3, under the section called Park Fixed-Drive Heads (F10).

Following are instructions for parking the fixed-disk heads by running PARK.COM.

Start with the A> prompt on your screen.

1. Insert the Diagnostics disk in Drive A.

2. Type: **park**

   You should see the following:

   ```
   The Leading Edge Fixed Disk Parking Program
   Version X.XX
   ```

   ```
   The correct drive type format is:
   ```

   PARK x <return>

x value	Manufacturer	Model	Capacity
0	Miniscribe	3212	10 meg *
1	Miniscribe	3425	20 meg
2	Miniscribe	8425	20 meg
3	Seagate	ST212	10 meg
4	Microscience	HH725	20 meg

   * This is the standard Leading Edge Disk Drive

3. Again type: **park**, this time followed by the value in the far-left column that corresponds to the type of fixed disk you have. Type: **park 0** if you have the standard 10-megabyte fixed disk.

   You should see the message:

   ```
   TURN SYSTEM OFF NOW!!!!!
   ```

4. Turn off the system.

Note: When you turn the system back on, the fixed-disk heads are automatically unparked.

PACKING UP

If you plan to ship the Model D long or short distances, or if you intend to store it, prepare the equipment as follows:

1. If you have a fixed-disk system, park the fixed-disk heads as described above.

2. Turn all components OFF.

3. Disconnect all cords and cables.

4. Coil cables and tape them to the system unit.

Tips for Short-Distance Moves

If you are moving your computer within your office or home, it is not necessary to repack each component and accessory. Have someone help you by opening doors, etc., so that you can firmly hold each piece of the system with both hands.

Here are some short-distance pointers:

o **Before you turn off the computer,** if you have a fixed-disk system, park the drive heads using the PARK.COM program described above.

o **Before you move the computer,** clear enough space at the destination site to accommodate all the components when set side by side.

o **Before you move the computer,** unplug and/or uncable all external connections.

o Move the system unit first, then each major accessory.

Tips for Long-Distance Shipment

1. Package each component separately.

2. Pack units in original cartons and use all the original packing materials (foam cushions, braces, plastic sleeves, etc.).

3. If you don't have the boxes the equipment came in and must use other cartons, make sure you cushion each component carefully.

SETTING UP AGAIN

1. Unpack the components with care at the new location, and save the packing materials.

2. Follow the instructions for setting up and checking out your system in Chapter 1.

3. It's a good idea to run the DIAGNOSE program (as described in Chapter 3) after a move, to make sure all the components of your system are in working order.

APPENDIX
SWITCH SETTINGS AND MEMORY UPGRADE

OVERVIEW

The first section of the appendix describes the switches and jumpers on the system board. The system board is the main circuit board of the Model D, occupying the "floor" of the chassis. The second section offers instructions for increasing the amount of RAM in your system.
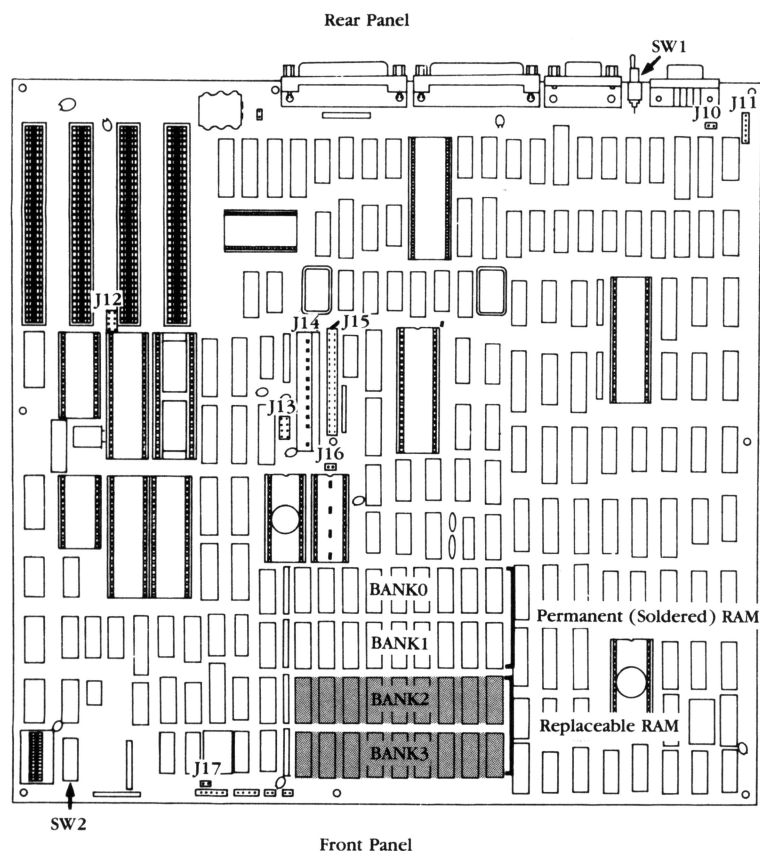
Figure A-1 Layout of the System Board

SW1 AND SW2

Besides the power switch and system reset button, the two most important switches on the Model D are:

1. The COLOR/MONO switch (SW1) that controls your monitor

2. The DIP switch (SW2) with eight microswitches

SW1: Color/Monochrome Switch

SW1 is located on the far left of the rear panel of the system unit. Set this switch to correspond to the type of monitor you plan to use: monochrome or color. See Figure 1-12 in Chapter 1.

If you have a monochrome display monitor, set SW1 in the " M " position.

If yours is a color monitor, set SW1 in the " C " position.

Note: Whenever you change the switch setting, you must also reset the system by pressing the reset button on the front panel.

As an alternative to setting SW1, you can invoke the MONO or the COLOR program on the MS-DOS disk. For example, if you have a color monitor, insert the MS-DOS disk and type **color** at the MS-DOS prompt. These MS-DOS programs work only with the built-in monitor controller. Use the MODE command to affect any accessory monitor controllers you may have installed. For more on MONO, COLOR, and MODE, see Chapter 5 of the *MS-DOS Reference Manual*.

SW2: Configuration Switch

The DIP switch, SW2, is located inside the system unit, on the front left corner of the system board. (See Figure A 1). The settings of the eight microswitches on SW2 control the following:

o   Numeric coprocessor installation

o   Amount of RAM that is automatically tested when you turn on the system

o   Number of installed disk drives

The table below lists the microswitch settings and their effects.

Microswitch	OFF	ON	Configuration
1	o		Normal system operation
		o	Loop on self-test
2	o		8087 coprocessor mounted
		o	8087 coprocessor not mounted
3	o		All memory tested at power on
4		o	
3		o	All memory tested at power on
4	o		
3	o		All memory tested at power on
4	o		
3		o	Only first 64K of memory tested
4		o	at power on (see note below)
5	o		Leave both off and select
6	o		COLOR or MONO with SW1 on rear panel
7		o	1 floppy-disk drive
8		o	
7	o		2 floppy-disk drives
8		o	
7		o	3 floppy-disk drives
8	o		
7	o		4 floppy-disk drives
8	o		

Note: When you boot the system, the ROM BIOS normally tests all memory installed on the system board. If have a lot of memory installed, this RAM test takes a while to run (for example, if you have 640K of memory, it takes 35 seconds).

To speed up the RAM Test, set both microswitches 3 and 4 to the ON position. This limits the memory test to the first 64K of RAM.

SYSTEM BOARD CONFIGURATION JUMPERS

The system board, the "floor" of the system unit, contains all the major circuitry that controls the Model D. Several jumpers on the system board configure the system for specific functions. Refer to Figure A-1 for the location of the jumpers listed below:

J10   Enables/disables the system board monitor controller. Remove this jumper if you are installing a separate monitor controller in one of the expansion slots.

J11   6-pin connector for a light pen.

J12   TOD clock, interrupt request selection.

        1   IRQ2 selected (default)
        2   IRQ4 selected
        3   IRQ5 selected
        4   IRQ7 selected

J13   Enables/disables the I/O controllers on the system board. If a jumper is removed, the corresponding I/O device is disabled. Remove a jumper if you are installing a separate I/O controller in one of the expansion slots.

        5   Asynchronous Communications Controller
        4   Floppy-Disk Controller
        3   Parallel-Printer Controller
        2   Real-Time Clock
        1   not used

J16   Installed ROM size

        no jumper (default)   8K or 16K ROM
        jumper installed   32K ROM

J17   Installed RAM size

        jumper installed   64K RAM chips
        jumper removed   256K RAM chips

UPGRADING THE RAM ON THE MODEL D

At some point you may want to add to the memory capacity of your Model D. Increasing the memory allows you to run programs that require more than 256K bytes, and it makes more work space available for programs that keep all of your information in memory.

You can add memory to your computer on your own without voiding the warranty if you follow the instructions in this section carefully.

The Model D comes with a total of 256K of RAM in four rows of 64K-bit chips (nine chips per row). Two of these rows are soldered permanently to the system board. The other two rows of chips are in sockets and can be replaced with 256K-bit chips to increase the memory size.

WARNING

Never mix 64K-bit and 256K-bit chips in the same row.

Detailed instructions for carrying out the memory upgrade you select follow this section.

What You Need

To add memory to your Model D, you need the following:

o   **For a total of 384K of RAM, you need 9 256K-bit chips.**

o   **For a total of 640K of RAM, you need 18 256K-bit chips.**

o   A small Phillips-type screwdriver

o   A DIP/IC extractor tool (designed for a 16-pin chip)

o   A DIP/IC insertion tool (designed for a 16-pin chip)

The last two items are available at a modest cost from an electronics supply store.

Gaining Access to the System Board

WARNING

Disconnect the power cord to make sure the system unit is not receiving any power.

If you have a Model D with a fixed disk, park the drive before beginning this operation (see Chapter 4).

---

1.   Using the Phillips screwdriver, remove the five screws holding the unit cover in place (two on each side, and one to the right/center on the rear panel).
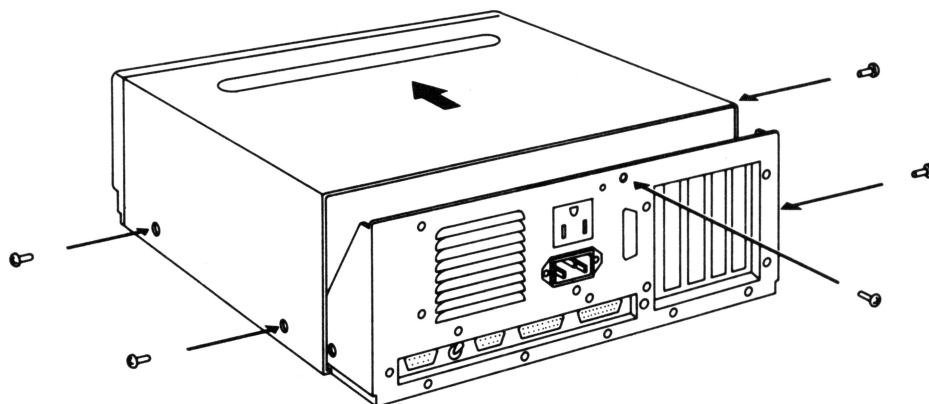
Figure A-2 Removing the System Unit Cover

2. Carefully lift up the rear of the cover, and slide it forward and off.

3. Remove the disk-drive cables from the back of the disk drive(s).

    Remove only the ends of the cables that are attached to the disk drives. Do not remove the ends that connect with the system board, or (in a fixed-disk system) with the fixed-disk controller.

    Note their orientation. The flat ribbon cables plug in with the cable extending from the bottom of the connector on floppy drives, and extending from the top of the connector on fixed disks.
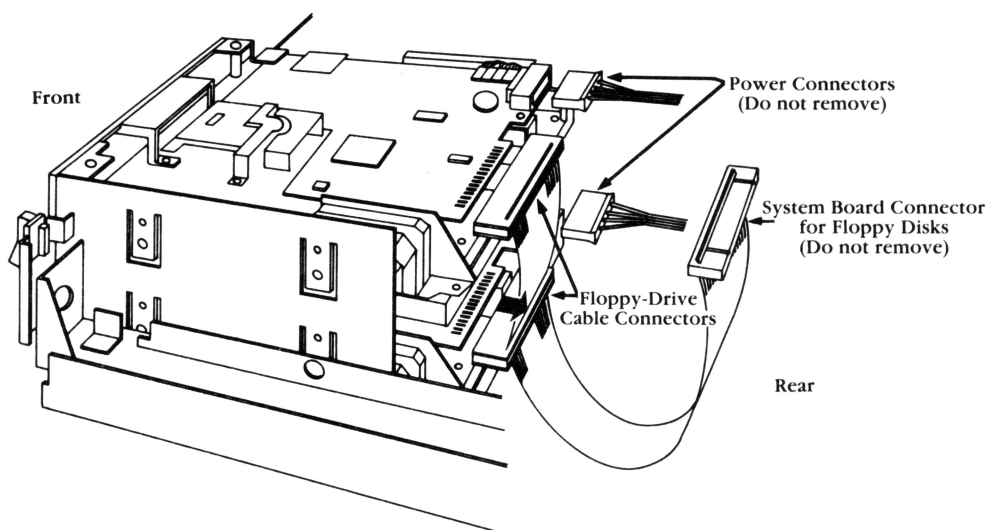
Figure A-3 Removing the Disk-Drive Cables (Dual-Floppy System)

4. Remove the main power cable from the system board connector (J14).
   (See Figure A-4.) (Directly behind the main power cable lies the
   floppy-drive connector on the system board.)
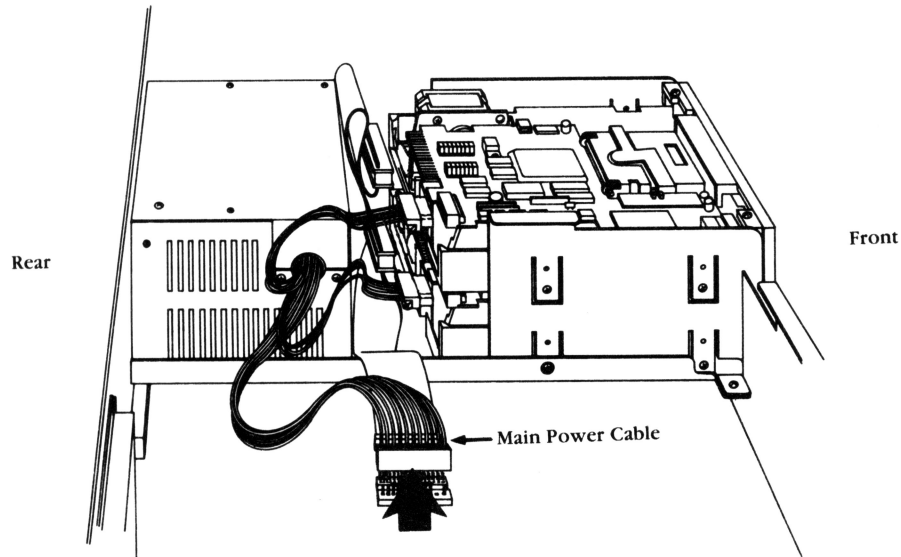
Figure A-4 Removing the Main Power Cable

Note that the lip of the connector will hold this cable in place very
firmly! Remove this cable by grasping all of the wires together and
pulling straight up.

5. Disconnect the power switch from the front of the frame by removing the
   two screws that hold it in place.

6. Remove the two screws under the disk drives on the front of the frame.

   Then remove the two screws from the back of the case that mount the
   chassis shelf to the frame, and remove the four screws that attach the
   power supply to the rear of the frame.
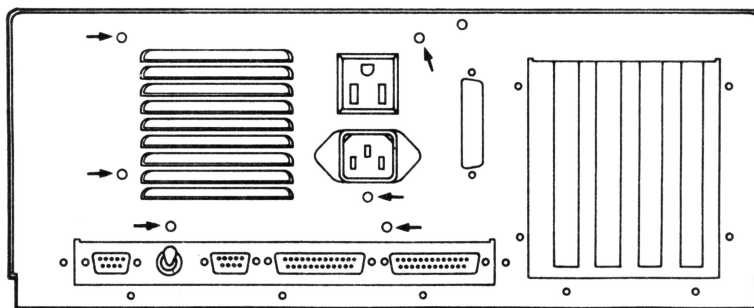
Figure A-5 The Screws Holding the Chassis Shelf

   7.   Slide the chassis shelf forward slightly, and lift it out of the frame.

Removing the 64K-bit Chips

   1.   First **remove Jumper 17** (J17, located next to the keyboard and speaker connectors at the front of the motherboard). Refer to Figure A-1 at the beginning of the Appendix.

   2.   Locate the two rows of chips closest to the front panel (banks 2 and 3). These rows hold the socketed (removable) set.

   3.   **Regardless of how much RAM you plan to install, you must remove all the chips in both socketed banks.** Carefully remove each chip from its socket as follows:

      Using the the DIP extractor, hook the small prongs of the tool between the chip and the socket on both ends of the chip and pull upward.

DIP/IC Extractor

Chip

Notch

Front Panel

Replaceable RAM Chips
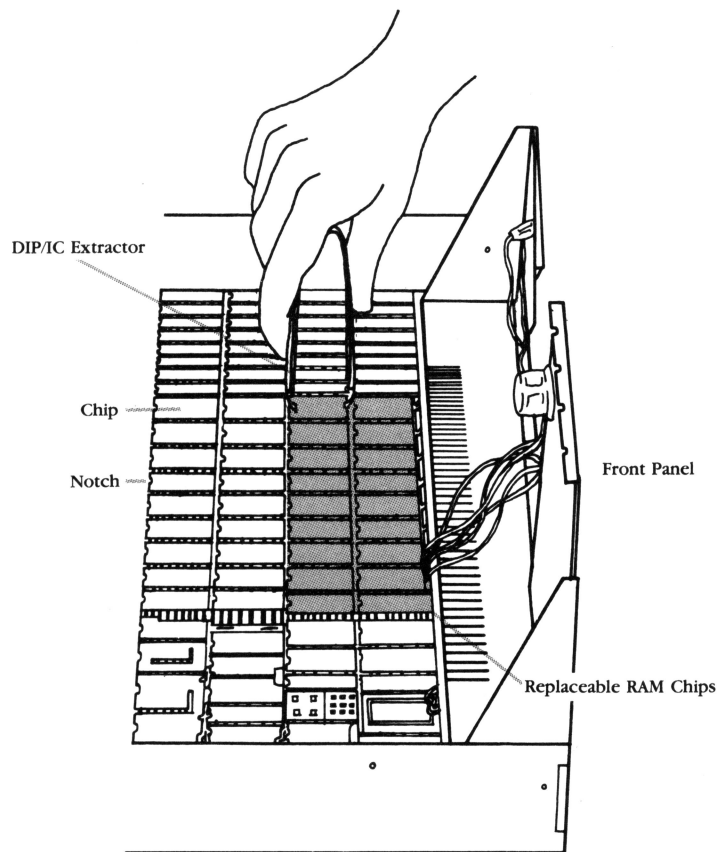
Figure A-6 Removing Chips from the Board

Inserting the 256K-bit Chips

WARNING

Be careful to avoid static that can destroy RAM chips! Do not remove the new chips from their antistatic packaging until you are ready to insert them into their sockets.

---

1. Carefully replace the removed 64K-bit chips with the 256K-bit chips, using the DIP insertion tool. Make sure that the notch on every chip faces toward the rear of the system unit, and that none of the metal pins is bent in the process.

2. If you want a total of 384K of RAM, insert a complete row of nine 256K-bit chips in Bank 2, leaving Bank 3 empty.

   If you are installing 640K of RAM, insert two complete rows of 256K-bit chips (a total of 18 chips) in Banks 2 and 3.

DIP/IC Inserter

Front Panel
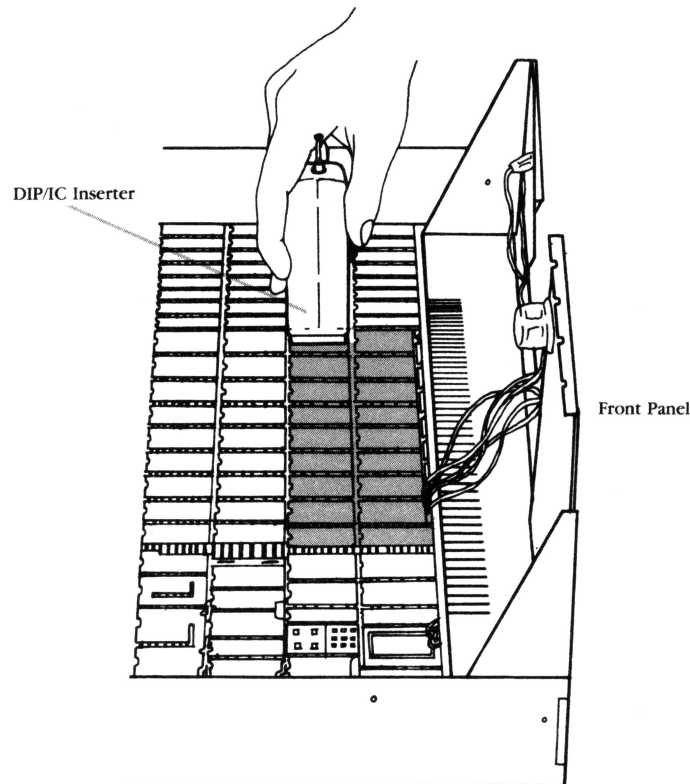
Figure A-7 Inserting Chips on the Board

Reassembling the System Unit

To reassemble, reverse the steps covered in the section called Gaining Access to the System Board.

WARNING

When reconnecting the main power cable to the system board, be sure holes and pins are strictly aligned.

ADDING A MEMORY EXPANSION BOARD

As an alternative to increasing memory by replacing chips on the system board, you may prefer to install a memory expansion board. The expansion board may contain either 256K-bit chips or 64K-bit chips, depending upon its specifications. When installing the board, be sure to set its switches to indicate the total amount of memory on the board.

GLOSSARY

application program -- a software program that consists of coded instructions for the computer to follow. Application programs are usually distributed on floppy disks and are sometimes called software or software application programs.

ASCII (American Standard Code for Information Interchange) -- the standard code computers use to store characters.

backup disk -- a reserve copy of your data or system disk that can be used in case the current disk is damaged. See *working copy*.

binary code -- a code recognized by computers that consists of 0's and 1s's. See *bit*.

bit (binary digit) -- element of the *binary code* understood by computers; a 0 or 1.

boot -- to start a computer by loading an operating system.

byte -- a unit of measurement used by computers. When you type DIR, MS-DOS displays filenames and their sizes in bytes. For example, 1024 means 1024 bytes.

controller -- a removable circuit board containing electronic components that enhance the computer's basic functions.

current drive -- the drive you are currently using.

cursor -- a movable marker that shows your current position on the screen.

device -- something connected to a computer. Examples of devices are printers, disk drives, and monitors.

DIAGNOSE -- a program on the Model D Diagnostics disk that tests the components of the computer. If it finds any problems, it displays error messages on the monitor screen.

directory -- a list of files and, possibly, subdirectories on a disk.

disk -- a storage medium consisting of a magnetic surface on which data is stored, similar to the way sounds are recorded on tape. See *fixed disk* and *floppy disk*.

disk drive -- a hardware component that stores and retrieves information on a disk. It can be either a *fixed-disk drive* or a *floppy-disk drive*.

disk operating system (DOS) -- the software that controls the overall operation of a computer system. A disk operating system is usually distributed on floppy disks, although you can copy it on a fixed disk if you have one.

display -- a visual presentation of information on the screen.

drive -- see *disk drive*.

drive name -- consists of a drive letter and a colon. A drive name tells MS-DOS what drive to look on for a file.

dual-floppy drive system -- a computer that has two floppy-disk drives. The drives are usually referred to as Drive A and Drive B.

error message -- a message that appears on the monitor screen to notify you when a problem has arisen with the hardware, the operating system, or your data disk.

external command -- an MS-DOS command that must be read from the MS-DOS disk in order to run. It is not resident in the computer's memory.

file -- a collection of related information with an identifying name. Programs and commands are contained in files, as are documents created with a word processor and organized data collections, such as spreadsheets and databases.

fixed disk -- a disk composed of magnetic coating applied to a rigid aluminum or ceramic plate. Sometimes called a " hard disk, " it is usually not removable (as is a floppy disk). A fixed disk has more storage capacity and faster access speed than a floppy disk. See also *sector* and *track*.

fixed-disk drive -- a drive that reads and writes on a fixed disk. See *fixed disk*.

fixed-disk system -- a computer that has one fixed-disk drive and one floppy-disk drive.

floppy disk -- a plastic disk, in a square protective cover, used for storing programs and files. See also *sector* and *track*.

floppy-disk drive -- a drive that reads and writes on a floppy disk. When you insert a floppy disk in a floppy-disk drive, the drive can read the magnetic surface of the disk. It can also write on the floppy disk. This is how information is passed to and from a disk and the computer's memory.

format -- to prepare a disk to receive and store information by dividing the tracks on the surface of the disk into sectors in a manner compatible with MS-DOS. Formatting erases any previous data stored on the disk.

function keys -- the F1 through F10 keys on the left side of the keyboard. When pressed, they perform certain editing operations on the MS-DOS command line.

hardware -- the physical parts of the computer; e.g., system unit, disk drives, printer.

input -- information entered into a program, rather than information produced by a program.

input/output (I/O) -- connection point through which the computer receives and/or transmits data.

internal command -- an MS-DOS command that is resident in the computer's memory after MS-DOS has been loaded. Internal commands run even when the MS-DOS disk has been removed.

keyboard -- the hardware device with a panel of keys that is used to type data or execute commands.

kilobyte (K) -- 1,024 bytes.

load -- to transfer data and programs from a disk into the computer's memory by inserting the disk into the disk drive and resetting the computer.

Master disk -- the MS-DOS disk that comes with the Model D. Make a working copy of the Master disk and then store the Master in a safe place.

megabytes (M) -- 1,048,576 bytes. 1,024 kilobytes.

memory -- the area of the computer that temporarily stores programs and data while the computer is on. The computer can quickly access what is currently in memory. Most programs come on a floppy disk. Usually, when you run a program, a disk drive transfers the program, or parts of it, from the floppy disk to the computer's memory. When the program is finished, it is transferred back to the disk. You can think of a floppy disk as permanent storage and the computer's memory as temporary storage. Memory is measured in *kilobytes* (see also *byte*).

message -- see *error message* or *screen message*.

modem -- a device that converts computer output (which is digital) to an analog form. This makes it possible to send information from a computer over a telephone line.

monitor -- the computer screen. It can be either monochrome or color.

motherboard -- see *system unit.*

MS-DOS -- a disk operating system created by Microsoft Corporation and supplied with the Model D.

multilevel directory -- a hierarchical structure for storing files.

numeric keypad -- the set of numbered keys on the right side of the keyboard. These also control cursor movement.

operating system -- see *Disk Operating System (DOS).*

output -- data transferred from a computer to a printer or to a file.

park -- to reposition the read/write heads in a fixed-disk drive so they cannot harm the magnetic surfaces of the fixed disk.

PARK.COM -- a program on the Model D Diagnostics disk that parks the read/write heads of the fixed disk.

parallel port -- used by the computer to transmit information to an external device, such as a printer. The information is sent eight bits, or one byte, at a time.

partition -- an area of a fixed disk that is reserved for the use of an operating system.

peripheral device -- any input or output device that is attached to the system unit.

PREPARE.COM -- a program on the Model D Diagnostics disk that creates a partition for MS-DOS on a fixed disk, formats it, and then copies MS-DOS system files on it.

printer -- a hardware component capable of converting data from a computer into printed form.

program -- a series of coded instructions that tell the computer what to do.

program disk -- a disk that contains program files.

prompt -- an onscreen indicator that tells you MS-DOS is waiting for your instructions. The MS-DOS prompt consists of the default drive letter (usually A, B, or C) and >. An example of an MS-DOS prompt is A>.

RAM -- see *random access memory.*

RAM Test -- a self-test that consecutively checks all the RAM installed on the system board.

random access memory (RAM) -- memory available for the temporary storage of programs and data while you're working with them; you can read from and write to the RAM. Any information in RAM is destroyed when you turn off the system unit's power.

read -- when a disk drive retrieves data from a disk, the computer is said to be " reading " information.

read only memory (ROM) -- memory that permanently stores information that was built into the computer during its manufacture; you can access this section of memory and read its contents, but you cannot alter it. The information is not destroyed when the power is turned off.

read/write head -- the element of a disk drive that writes data to a disk and reads or erases it from a disk.

reboot -- turning the computer off and then on again. Memory is cleared and an operating system is loaded. Differs from *system reset* and *warm boot*, where you do not turn off the computer but merely press the reset button or **CTRL, ALT,** and **DEL.** See *boot*.

reset -- see *system reset*.

ROM -- see read only memory.

RS-232C port -- connector that transmits data in a serial format to peripherals such as a printer or a modem.

screen message -- a written message that appears on the monitor screen and instructs you to type an entry or press a key.

sector -- on a disk, one of eight sections of a *track*. A double-sided floppy disk contains over 300 sectors, a 10-megabyte fixed disk has over 20,000, and a 20-megabyte fixed disk contains over 40,000. Each sector has its own address that the computer uses to locate information stored there.

serial port -- used by the computer to transmit information to an external device, such as a printer or modem. The information is sent one bit at a time.

software -- programs that run on computer hardware. Software consists of coded instructions for the computer to follow.

subdirectory -- a directory within a directory.

system board -- the main circuit board of the computer. It contains the central processing unit (CPU) and all related circuitry. On the Model D, this includes the parallel port, serial port, time-of-day circuitry, and floppy-disk controller. Sometimes called a " motherboard ."

system reset -- to clear the computer's memory and reload the operating system by pressing the reset button or simultaneously pressing **CTRL, ALT,** and **DEL.** Differs from a *reboot*, in which you turn the power off and on. Sometimes called a *warm boot*.

system unit -- the main component of a computer, usually separate from the monitor and keyboard. The system unit is where the actual manipulation and storage of data take place.

track -- a division of a disk. Each disk is divided into a specified number of tracks, which are further subdivided into a certain number of *sectors*. A doubled-sided floppy disk has 80 or more tracks, a 10-megabyte fixed disk has over 1200, and a 20-megabyte fixed disk contains over 2400.

warm boot -- see *system reset*.

working copy -- the copy of a disk you make for daily use in order to lengthen the lifetime of the original. See *backup disk*.

write -- when a disk drive records data on a disk, the computer is said to be " writing " information.

write-protect -- to guard a floppy disk from being written to or changed so that data already on it can't be destroyed. You write-protect a disk by affixing a small adhesive tab over the write-protect notch on the upper-right side of a floppy disk. Never write-protect current data disks.

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